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AIDS TO EFFICIENT PACKAGING OPERATIONS.

3078 ① Packaging ~~organizations~~
↳ specifications

② Filling equipments

③ Automatic processing

④ Packaged products

⑤

PACKAGING SERIES | NUMBER 41

Aids to Efficient Packaging Operations

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PACKAGING SERIES | NUMBER 41

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The object of the publications of the American Management Association is to place before the members ideas which it is hoped may prove interesting and informative, but the Association does not stand sponsor for views expressed by authors in articles issued in or as its publications.

M. J. DOOHER, *Editor*
ELIZABETH MARTING, *Proceedings Editor*

A New Approach to Packaging Organization

Techniques at the National Biscuit Company

¶ **Edward A. Lindquist**

Manager, Packaging Division, Production Department
National Biscuit Company, New York City

THE EVOLUTION of cracker packaging is something to marvel at. No doubt many of us can recall the days when crackers were packed in barrels and manually handled and weighed prior to sale. In fact, as late as 1930 in certain sections of these United States, cracker merchandise was packed in barrels, bushel baskets, drums, tin cans, and wood boxes by the National Biscuit Company.

However, in 1899, the first great advance was made. With the introduction of Nabisco's Uneeda Biscuit, crackers for the first time were packaged in separate containers and displayed and sold as a unit. Uneeda was the first cracker to be packaged and sold nationally under a single brand name, and it revolutionized the grocery business. The machine age began—at long last—to rear its head in the cracker business, and the job of eliminating some of the back-breaking tasks in handling was under way.

It was a good deal for the customer, too. It brought the housewife a cracker that was fresh and unbroken, a cracker that retained much of the original crispness and flavor that heretofore had been lost when the cracker barrel was opened in the general store. Uneeda Biscuit sounded the death knell of the cracker barrel, and nobody was very unhappy about it.

The introduction of the Uneeda Biscuit unit packs was also a sign for the evolution of packaging machines. There was a period of intense technological development, intense specialization, and a much higher rate of production per unit of human effort. The battle of productivity was on, and I think I am right in stating that it has never ceased. This battle of

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¶ **THE AUTHOR**

As Manager of the Packaging Division of the National Biscuit Company, *Edward A. Lindquist* supervises the packaging of all Nabisco products. He began his career with National Biscuit in 1935 as a student in bakery operations, and has served as Packing Department Foreman and Personnel Manager at the Chicago bakeries. He was a traveling packaging specialist from 1947 until 1949, when he assumed his present position.

productivity, coupled with the machinery development, brings us up to the heart of this discussion.

THE PACKAGING PROBLEM

First and foremost, we at Nabisco are bakers—bakers of quality merchandise that must reach the housewife in a condition in which all factors of crispness, flavor, taste, and appearance are retained. To meet these specifications we are, secondly, packaging people, and this covers the entire field from raw materials through machinery design and building. Packaging at our company is a big thing; I shall not hazard any opinion as to its position of importance over sales, merchandising, purchasing, etc., but I do know that packaging is the one phase of our operations that is confronted with the job of getting the product out to our customers in first-class condition, attractively packaged so that housewives will go out and purchase NBC products on a repeat basis.

We have a very "fussy" product. It isn't a block of wood, or a piece of iron, or a jar or a bottle. Our product is fragile and sensitive; it has ingredients and finishes that are affected by heat and mechanical handling. We want our crackers and cookies to retain as much of their freshness and quality in the package as possible.

But, in addition to providing protection, the package has to look attractive. More and more of today's grocery buying is done on an impluse basis, and the appearance of a product on the grocer's shelf has a whole lot to do with the way it sells. Our package has to be good-looking and appealing. Good-looking and appealing, yes, but from whose standpoint? That of the dealer, the salesman, the inspector, or the customer? Naturally, the customer. This is a premise we start with—the customer is right as to the thing he or she can see. Naturally other factors enter into this picture —cost, protection, competition, etc.

INCREASING DEMANDS

During the past five years, Nabisco has started into production six new cracker bakeries equipped with high-production band ovens and, in most cases, complete newly equipped packaging lines. As these new bakeries went into production, they were accompanied by the tremendous growth of modern well-constructed and designed food outlets and supermarkets with the latest methods for displaying food packages. In addition, suppliers of package materials have made greater strides since the end of World War II by providing greater protection for the product and at the same time creating eye appeal for the package to stimulate impulse buying by the consumer. With huge displays of package merchandise in these modern food outlets, it is necessary today that the package sell itself. With the demand for packages that provide greater protection for the product and have the necessary eye appeal, it has been mandatory that Nabisco re-equip practically every packaging line since the new plants started into production.

To provide Mrs. Consumer with the type of package that is acceptable is only part of the problem, for we in packaging must also recognize the tremendous improvements made in the baking of our products. The change from the reel to the band oven has in most cases materially increased our

production tonnage. As an example, for a given product the reel oven produced 3,500 biscuits per minute with hand packing. The band oven on the same product will produce 10,600 biscuits per minute and, if hand-packed, would require considerably more packing labor than handling the flow from the reel oven, which under today's economic setup is most impractical. The band oven in the baking industry is setting the criterion for efficiency, and we in packaging must meet that challenge and provide packaging units that are at least as efficient as the band oven (better, if possible) and still produce the type of packages required.

NABISCO'S PACKAGING COMMITTEE

With hundreds of various types of packages on the market for our products and the changes that are constantly being made in our packages, how do we at Nabisco weld all these phases together?

In our company, we have a Packaging Committee. The committee is composed of a chairman and representatives from each of the following departments: Purchasing, Sales, Merchandising, Production, Research, Engineering, and Advertising. The function of this committee is to pass on all new packaging for existing and proposed products. As can readily be visualized, every department represented has a definite and important role in the packaging of our products. In addition, the decisions of the Packaging Committee are binding for all departments; and, when a packaging idea is adopted, the various departments proceed at high speed in turning the adopted idea into reality.

With top management represented on the Packaging Committee, we are able to keep in constant touch with current developments in the field and make decisions. The latest information concerning new packaging is steadily being sifted and reviewed, and the findings help us determine the best course of action for our own packaging program. Meetings are held periodically, but if necessary any member of the Packaging Committee can request a meeting promptly to present a problem that requires immediate attention.

The purpose of the Packaging Committee is to assist the Nabisco organization in providing the right type of package for our products at all times and also to keep the Nabisco packages far ahead in the field of competition. It provides information concerning the thinking and desires of all departments on packaging, which enables all packaging personnel to plan accordingly. Thus the Packaging Committee is the clearinghouse for all packages to be developed on new and present products.

Nabisco, through the Packaging Committee, recently finished the redesigning of all its packages. In addition to the familiar red Nabisco end seals, a triangular Nabisco seal now spans the upper left-hand corner, bringing a family resemblance to the entire line of packages. The phenomenal growth of self-service stores had much to do with this decision. Nabisco needed a positive over-all identification for its products, and the corner seal solves this problem.

THE GOAL SET

The goal which has been set by our Packaging Committee is simple and direct: All packaging lines must be fully mechanized and automatic to the greatest extent possible. They must result in packages which

will keep Nabisco products ahead of the competition and at the same time be economically produced and easily handled in the bakeries.

Automatic packaging requires a great deal of Engineering, Research, and Production time to work out the various problems involved. Therefore, we have recently formed a subcommittee of the Packaging Committee. This group is composed of a representative of the Laboratory and three members of the Production Department. Its function is to do the basic exploratory work on new thoughts and ideas regarding the adoption of automatic packing for existing lines and the use of new materials, such as the various films (polyethylene, saran, etc.). The findings of this group are later presented to the Packaging Committee at its regularly scheduled monthly meetings. It should be said, incidentally, that the subcommittee's meetings are not regularly scheduled; they are usually called when any member gives birth to an idea. This subcommittee is composed of practical packaging personnel operating under the theory that all packaging must be semi- or fully automatic.

Rather than discuss the mechanics of the Packaging Committee operation, I should like now to describe in detail the results of two packages which have proved successful and what transpired to bring these products and packages to the public.

Let us first follow through on the development of a new package.

NEW PRODUCT—NEW PACKAGE

Work on Nabisco Cocoanut Bars (snack size) was started just about two years ago. As is often the case with ideas for new varieties, this one came from our Sales Department. Several salesmen and managers in the field had reported that there was a definite spot in the market for a new cocoanut product. The Sales Department passed along this information to the Production Department's New Varieties Division, and the two groups got together to discuss the pros and cons of the idea. At this time, the Production Department reported that it had been working on a new line of cookies that could be dump-packed in printed stand-up cartons, like the 7¼-ounce Nabisco Vanilla Wafer carton. A cocoanut product, if the right size, seemed a natural to introduce this line.

From here on, the New Varieties Division took over as coordinator of the work being done by other departments in the company. The first step on the agenda was for the Experimental Bakery of the New Varieties Division to develop the formula (recipe) and to decide on the size of the cookie. Three things had to be kept in mind.

1. We were after a good basic product that could be served any place, any time.
2. We wanted a product that would have long shelf life and would not break easily in dump packing or shipment.
3. The price had to be low enough to be attractive.

The Experimental Bakery developed and baked six different formulas in small batches in order to get the desired flavor, crispness, and texture. These cookies were also baked in different sizes and shapes, and the snack size was arrived at by cutting an experimental bar cookie in half. Several General Office employees who make up Nabisco's Taste Panel sampled the different batches to help determine which tasted the best and would have the most consumer appeal.

ALL DEPARTMENTS IN ACTION

When the size and formula for Nabisco Cocoanut Bars were definitely set, other departments swung into action. The Engineering Department designed the die necessary to cut the dough into the snack-size shape. The Advertising Department supervised creation of the package design. The Purchasing Department bought the ingredients and arranged for printing the cartons at our Beacon printing and carton plant. The Laboratory tested the ingredients to make sure they met our rigid standards. The Traffic Department planned economical and speedy transportation of ingredients to bakeries and shipment of the finished product to sales branches. The Production Department selected Houston and Pittsburgh bakeries to make the cookies. The Legal Department approved the name and listing of ingredients on the package. The sales force held store samplings in all areas, arranged for store materials and display, and introduced the product to the public, district by district. And the Home Economics Division took publicity photographs and wrote releases for food editors throughout the country.

Final approval of Nabisco Cocoanut Bars, snack size, came in January, 1952, after all details had been worked out. And production was started on April 1 for the Eastern Division. By July 1, Nabisco Cocoanut Bars were in national distribution, and since that date they have been available all over the country.

They're a big favorite now, but no one person at Nabisco can pat himself on the back and take credit for this accomplishment. For, in developing any new variety, everybody gets into the act and works hard to make it a success.

NEW OVERWRAP TRIED

A short time ago, the Packaging Committee was requested to consider production of a group of packages to be overwrapped with printed foil. After a thorough examination of the problems involved, it was decided to go ahead with the idea. Rather than re-design the package of one of our established varieties, we decided to produce a brand-new cookie which we called Chocolate Chip Pecan. We selected an established package, the style and type of which we knew had won consumer acceptance, and overwrapped it with aluminum foil. The new Chocolate Chip Pecan cookies were produced on existing equipment already available for this type of carton, and we arranged to begin with limited distribution. If we found that the customers liked the new product, we could place it on a national distribution basis in short order.

The new product and package were an immediate success.

Why was the package a success?

1. Product retains same characteristics as when freshly baked (excellent shelf life).
2. Package has eye appeal (design).
3. Package easily opened and re-closable.
4. Nabisco corner seal used (identification).
5. Breakage almost non-existent (laboratory test; actual shipping test).
6. Price easily afforded by consumer.

IMPORTANCE OF MARKET RESEARCH

What indication did Nabisco have in advance of the actual marketing of Cocoanut Bars, snack size, and Chocolate Chip Pecan that these products and packages would win consumer acceptance?

Prior to starting new products and packages into production, the Marketing Research Division generally takes over and market-tests the product and package, either on a limited or large scale depending on past experience with similar products. Provided the Marketing Research tests are satisfactory, we then proceed in high gear to market the product and package.

Why is the Premium Saltine "in-er-seal" package different from competitive packages of a similar product? What prompted Nabisco to acccept the different approach when designing the Premium Saltine "in-er-seal" package rather than the method utilized by competition?

The answer to these questions is that Nabisco conducted a consumer survey in a given particular area with our Premium Saltine "in-er-seal" package and, with the information obtained from that consumer survey, we adjusted our thinking and the package as it is constituted today. This advance information materially assisted the Packaging Committee in determining the type of "in-er-seal" package to adopt. That is the reason why the Premium Saltine "in-er-seal" package as constituted has today won consumer acceptance. Marketing Research is a valuable tool to the packaging committee in determining consumer preference for both product and package.

SUMMARY AND CONCLUSIONS

This procedure is not necessarily followed for every individual product that we manufacture. There are some deviations: some products may have only a different wrapping; others may require only different ingredients printed on the package, etc.

Today's manufacturing processes—and baking is here included—are more exact, more complex, more integrated, produced at higher speed and within very close limits. All these requirements necessitate greater engineering in the product itself. They also point out the fertility that still exists in the package machinery field. Progress has been registered on many fronts. In some cases improvements have been made in long-established equipment or its uses. In others there has been some development along the line of new materials or new equipment, though this has been limited.

Believe me, a number of manually performed packaging operations still exist in the baking industry today. Far too many. These operations by hand are expensive, inefficient, time-consuming, and wasteful—and they are a stumbling block in the path of packaging progress. For our company —or any baking company—in this day of invention and electronics, to package manually is to continue to contribute unnecessarily to production costs and to mark time when we ought to be marching ahead.

Before closing this discussion of packaging techniques at NBC, I should like to leave another thought with my fellow-members of the packaging fraternity. I have mentioned the evolution of packaging and the

advent of the machine age. The elimination of the cracker barrel was a milestone in the industry. However, it was not until 1950, or 50 years later, that the next major step was made in cracker-packing. This was the elimination of hand packing of crackers into cartons. There were others —the introduction of the bulk filling and weighing equipment for certain varieties—but these contributions are small and, above all, have been too long in coming. As a whole, I think the advance of packaging equipment is slow when one starts making comparisons with the chemical field, the aircraft industry, radio, and television.

We at Nabisco, through our Packaging Committee and in every department of the organization, have one primary objective. We want to pack our products in the finest packages it is possible to develop. We want to please and satisfy Mrs. Consumer. She is the boss in our business, and we want to keep her happy.

The Accurate Writing Of Packaging Specifications

¶ Arthur R. Schettel

Manager, Package Standards Department, E. R. Squibb & Sons
Division of Mathieson Chemical Corporation, New Brunswick, New Jersey

WE IN THE drug and food packaging business, as well as all companies that package *any* product, are in the business to *sell* merchandise—at a profit. In order to sell, we must package; in order to package, we must determine the how, when, and why and the most economical basic package that will give the product maximum protection, as well as the one with the most sales appeal.

The foundation of this basic packaging precept of accurate package specifications is obtaining articles of suitable quality, based on accurate specifications, and checking materials based upon these proper specifications. As to the question, "Why are specifications necessary at all?" the answer is easy: Specifications are no more than an accurate description of material to be purchased. Accurate specifications are a "must" in any well-run business.

¶ THE AUTHOR

Arthur R. Schettel earned his Ph.G. at Long Island University, afterwards working as a registered pharmacist until 1941. Since that time, he has been with E. R. Squibb & Sons, Division of Mathieson Chemical Corporation, holding positions related to Quality Control, Narcotics, and Packaging and Package Development before becoming Manager of the Package Planning Department at New York. In his present capacity as Manager of the Package Standards Department, he is responsible for Purchase Specifications and Package Standards.

TYPES OF SPECIFICATION

Specifications must be shown for procuring material of reasonable consistency for standard production. There are many forms of specification, indicated by:

1. *Blueprint or Dimension Sheet.* Specification by blueprint or dimension sheet is advisable in the purchase of tools, fixtures, and container materials to be manufactured or fashioned to meet special requirements usually worked out by the Package Development and Engineering forces of the purchasing company. Blueprints provide a safe and easy method of checking against specifications when articles are received and inspected. Before numbers can have adequate meaning, there must be satisfactory points of reference. In developing these, all factors must be considered that have an important bearing on the numbers to be evaluated. Critical dimensions are usually shown decimally and others usually as fractions. Standard tolerances can be added at the bottom of the print, and critical tolerances are normally indicated at the specific checkpoint.

2. *Chemical Analysis or Physical Characteristics.* Specification by chemical analysis or physical characteristics should be used rarely. Ordinarily, the vendor, if he knows the use for which the goods are intended, is in a better position to determine proper materials and methods of manufacture than the buyer. This type of specification sometimes requires inspection at the vendor's plant, which is normally expensive. It should be used only in cases of very particular and special requirements.

3. *Brand or Trade Names.* Specification by brand or trade names places the buyer in entire dependence upon the vendor's reputation for quality. It should be used in cases where branded products have been found to be superior to all others for purposes intended and the formula of composition is secret or unknown. It may also be used in cases of standard products used in unimportant processes or quantities, when extent of use does not justify the expense of investigation or detailed specifications. The Purchasing Department should attempt to have at least two and preferably more than two approved brands. "Suntop or equivalent" is not sufficient. "Suntop, Hightower, or Bayview brands" is sufficient. There are comparatively few brands that do not now have a competitive or equal grade.

4. *Identification with Standard Specification* known to the trade generally and to the vendor. Specification by identification with some standard already published and accepted is a most satisfactory form of specification, provided such a standard exists to meet the purchaser's requirement and can be accepted without undue and necessary expense.

5. *Description of Purpose and/or Use.* Specification by description or use is an admirable form. If the vendor is dependable and will accept such a specification, it is entirely his. This is the least difficult form of specification to prepare and is recommended especially in the purchase of machines, or tools, about which the purchaser has no particular knowledge.

6. *Samples.* Specification by sample is not recommended except in cases where no other type of specification is possible. Samples are subject to physical change, and their use as standards is often a cause of dispute.

7. *Method of Manufacture and Detail of Material.*

There are certain requirements for an industrial specification for material. It should be:

1. As simple as is consistent with exactness. Unnecessary detail in specifications is expensive.
2. Identified, when possible, with some brand or specification already on the market. Special non-standard goods are expensive.
3. Capable of being checked. A specification is of value only insofar as it can be checked.
4. Reasonable in its tolerances. Unnecessary exactitude is expensive.
5. Capable of being met by several vendors. This will stimulate competition.
6. Clear. Misunderstandings as to specification are expensive.
7. Flexible. Inflexible specifications defeat research progress.

When commodities are covered by commercial standards, the purchaser's task is greatly lessened, since it is necessary only to specify desired grade according to the standard and the seller may guarantee conformance. Frequently, provision is made for a certifying label as an assurance to open-market buyers. These labels normally state names of guarantee, commodity and grade covered, name and number of the commercial standard, and a definite concise guaranty of conformance to all requirements.

All specifications must be reasonably checked. Inspection is not a function of the Purchasing or Package Development Departments, but items purchased should demand adequate inspection. Additional copies of the purchase specifications are given to the Quality Control Department for comparison with incoming shipments.

SPECIFICATION DEVELOPMENT

The easiest way to indicate how specifications are developed in the organization of E. R. Squibb & Sons, which is a division of the Mathieson Chemical Corporation, is to take a specific example and follow it through.

In setting up our New Line Octagon Bottle specifications, we endeavored to use the best features of both the Blake bottle and the more commonly used Round Wide Mouth bottles, both of which were in use. We reduced the number of tablet and capsule bottles used from 89 to 30 and the neck finishes from 20-odd to 8. Each bottle was stepped up in 15 per cent increments from the smallest, which was the 10-cc. bottle. Rigid, but not impossible, tolerance demands were set up and met by the bottle companies in order to utilize all the big-volume items on production line equipment. Plus or minus 1/32 inch is required on bottles up to 180-cc. and plus or minus 1/16 inch on the larger ones.

The 151-cc. bottle is selected as a representative item. After setting up the physical bottle size, based upon volume and general pattern, front and back label sizes with a tolerance of plus or minus 1/32 inch are added to the label specifications in the proper grouping. Then the individual folding cartons are set up. Again, in close cooperation with the package machinery companies as to details of flap styles and slit tuck locks, the blueprint of the carton, which is 0.016-inch board for this size, is set up, based upon the allowance of plus 1/32 inch over the high side of the bottle's tolerance. Bottle molds wear; and we know that, although initial deliveries will be rather loose in the carton, room must be left to be able to machine-carton all productions. This carton blueprint indicates size of cartons and details of flap, type of board, grain, unvarnished specifications, method of pack-

ing, whether in cartons or trays, panel numbers, plus any special details that must be incorporated. Each printed carton also has an additional, individual specification sheet yielding specifications for printing details such as color, data regarding identification spots, and details for the unvarnished portion used for the imprinting of the control number and expiration date, if required.

A further word about "identification spots." We have up to 75 combinations of products, potencies, and languages in a certain basic size of individual carton. In order to promote a final check at the production line, each carton has an identifying mark extending across the score line between the back and right side panels of the carton. When the cartons are packed correctly in trays or large cartons by the vendor, the machine operator can then tell at a glance, by running her eye along the pattern of identification marks, whether this tray may contain mixed cartons—of the same size, of course, but intended for a different product. Single, double, and triple one-point rules are commonly used. If the carton is printed in two colors, the spot is usually in the extra and more prominent color to aid in further differentiation. Accurate specifications on machine-run bottles and individual cartons are developed and made possible by close contact work with our Industrial Engineering group and with representatives of various vendors as needed, which appointments are arranged for with the cooperation of the Purchasing Department.

The 5-ounce bottle with the 45-mm. C. T. finish is normally used on the high-speed capsule-filling lines. Originally, after the bottle was filled, capped, and run through the Jones cartoner, it was picked up by two packers and one dozen cartoned bottles were placed into a regular slotted corrugated box with corrugated partition. These were sealed with pieces of two-inch gummed tape, bottom and top. Four of these filled dozens were packed into a 200-lb.-test corrugated glue-sealed packer. As an example of bringing specifications up to date, we found that the RSC case for 12, when taped up at the bottom in readiness to receive the filled bottles, was rather difficult to handle when prestacked, and it was planned to replace this RSC with a conventional Lambert-style two-piece box with a correctly fitted corrugated partition. When these replaced the wobbly RSC box, a considerable saving resulted. The RSC box was discontinued for this size of bottle, and the Lambert box is now designated and has been added to the purchase specifications.

STANDARDIZATION PROGRAM

In our organization, all specifications for containers—that is, bottles, ampuls, caps, bands, cartons, tubes, shippers, and many more, including devices and physician's samples—are developed by our Package Standards Department, which used to be a part of the Research and Development Division. Recently, this function has been transferred to Manufacturing, world-wide.

Purchase specifications, with each container group shown separately, are issued on tabulated mimeographed sheets for physical sizes and on Ozalid prints for special drawings which are supplied to the Purchasing, Container Control, Printing, Receiving, and Industrial Engineering Departments.

Going down the checklist for accurate specifications, as far as assign-

ing our standardization program of containers to any new product is concerned, we must of course consider the physical form of the product and the protection required. The strength of the container and the packing thereof are also carefully considered, usually on the basis of past performance and know-how. Details of specific physical conditions for any particular product are to be obtained from Research and Development, coupled with the reaction of the Sales Department, the Packaging Department, and the Industrial Engineering Department. The specification for the package includes evaluation for minimum cost and availability of material. Obviously, the writing of package specifications calls for infinitely close attention to detail.

Specifications are released by the Package Standards Department under a nomenclature system characterized by a five-digit number composed of a two-digit prefix denoting the class or type. Thus we start arbitrarily with Series 50 for general bottles, Round Wide Mouth, ADMA, or Blake, and our New Line Octagons. Series 51 is used for serum bottles of all USP types of glass; Series 52 for the Oval Octagon Household line of bottles; Series 60 for folding cartons; Series 61 for folding carriers; Series 63 and 64 for corrugated shippers; and so on. Having so many products in the printed individual carton series, for example, we ran out of numbers and selected another group, Series 74. This is rapidly being exhausted, too.

NEED FOR ACCURACY

Our standardization program, with its minimum of basic size codes (which is always to be desired in any organization), is held to that modicum with the assistance of accurate specifications.

Purchase specifications are supplied to the Purchasing Department, which forwards them to the respective approved vendors. Our Container Control Department identifies the shipments and passes or rejects them according to their established system of comparisons. Accurate specifications include methods of packing, bundling, tying, and handling when necessary. All incoming shipments are required to be marked with the order number and code number of the particular item contained therein. Setup boxes are specified as "H"-packed where size permits, and those with platforms and filler blocks are handled with a separate code number for the tops and bottoms.

Specifications are kept up to date by constant checking and revisions of the various tabulated sheets and special prints. Specifications may change upon advice from the Purchasing, Industrial Engineering, and Packaging Departments. A special source of supply that is equally responsible, with a better price and delivery, may start a chain reaction for container changes beginning with the prime container. Specifications may have to change in the event of advice regarding better handling or filling. Each alternate proposal is carefully run down to see that all departments concerned are in complete accord in order that the change may be made smoothly. Changes may be based upon exhaustion of obsolete materials —order immediately, use upon receipt or immediately—which means that no further production can take place until the improved materials are at hand.

Government bids and contracts are still an important factor in many productive firms. They are a perfect example of the need for accurate specifications. While they usually are well phrased, many can be interpreted

ambiguously, but the specifications "are in there," as the traveling salesman said about the overcoat on his expense account!

Another example of the prime use of accurate specifications at Squibb concerns the case of the Dispolator vials. These glass vials were needed in a special size to accommodate three polystyrene Dispolator cases, filled with Dihydrostreptomycin powder, which is notoriously hygroscopic. That meant a polyethylene stopper, of course, and the importance of tightened tolerances in this case cannot be underestimated. The interference of the minimum stopper into the maximum glass shell vial must be at least 0.006 inch, and the interference of the maximum stopper and the minimum I.D. of the vial at its fire-polished rim must be no more than 0.030 inch. The use of a desiccant in the bottom of the vial, covered with a pledget of cotton, insures the protection of this product.

The design and tolerances encountered in fashioning specifications for the Becton, Dickinson Disposable Plastic syringes used for the sterile duomatic cartridge can also be classed as an example of the importance of accurate specifications. The medication is contained in a glass cartridge in two forms: Crystalline Penicillin G Potassium and Procaine Penicillin as a powder is placed into the bottom of the cartridge, atop a bottom or aspirating stopper, and topped with a center stopper positioned immediately over a by-pass in the side wall of the glass at the center of the cartridge. This stopper is lubricated and must be of such dimension and tolerance that it can protect the hygroscopic Penicillin mixture from the action of the aqueous diluent directly above. At the same time that this center stopper is protecting the product, it must also retain its motility after a shelf life of up to 18 months. The aqueous diluent is then sealed by a third stopper, which again must maintain its protection of the product and still retain its motility as well. In use, the needle guard is used as the stopper plunger and the liquid is forced down into the bottom chamber through the by-pass so that a suspension may be obtained and injected into the patient after aspiration, accomplished by the flange of the bottom stopper within the syringe barrel. Obviously, close work with the syringe and glass supplier, along with the finest cooperation on the part of the rubber stopper supplier, was indicated in order for all supplies to work smoothly at any extreme of tolerance. The I. D. and O. D. and over-all length of the glass must be considered along with the depth and length of the internal by-pass. Special instructions were given for the fire-polished finish on each end of the cartridge. The plastic disposable syringes' critical dimensions were the I. D. of the barrel and the O. D. of the tip whereon the needle guard was to fit tightly to provide an aseptic fit. The length, gauge, and tolerance of the needle were also worked out. The rubber stoppers were fashioned with the able assistance of the West Company, which was able to hold the tightened tolerance, where critical, to plus or minus 0.001 inch on the all-important diameter.

* * *

In conclusion, I can only repeat that accurate specifications are a "must" in any well-run business and that the writing of package specifications calls for infinitely close attention to detail. Changes cannot be made on any item until all of the other items affected by the first change can be checked and explored with a view toward complete run-out without danger of obsolescence.

Getting Optimum Performance From Filling Equipment

A PANEL DISCUSSION

Panel Chairman:

EDWARD P. LEE, *Technical Assistant to the Director of Manufacturing and Engineering, General Foods Corporation, New York City*

Panel Members:

WILBUR R. GOUVEIA, *Technical Director, Fleischmann Distilling Corporation, New York City*

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INTRODUCTION

By Edward P. Lee

GETTING OPTIMUM performance from filling equipment is not attained by trick formulas or by waving a magic wand. Strict and scrupulous attention to every detail is required. In contrast with the fisherman who let the big one get away, the American management team has won considerable reputation for sifting out the big causes of economic loss. All too often, however, the sieve has been too coarse or poorly handled and a multitude of small losses have been getting away. It is these individually small losses that make the difference between average and optimum performance on the packing line. The filling machine—the machine that measures out your product for the consumer and that frequently sets the pace for the line—is an ideal place to begin to stop these losses and to plug the profit leaks.

Optimum performance can be thought of as operating suitable equipment at the maximum accuracy and capacity consistent with maintenance cost, container damage, and change-over time. Reference to speed is de-

See page 31 for biographical sketches of chairman and panel members.

liberately omitted here. Speed is the rate of operation. Capacity is the rate of satisfactory output. They are not necessarily the same. A machine running empty has speed though it does not produce. Optimum accuracy means fewer consumer complaints and better yield. Optimum capacity results in lower labor cost and lower overhead, due to better use of floor space, power, supervision, and time. Improvement of either accuracy or capacity at the expense of increased maintenance, labor cost, or container loss is to enjoy only a temporary advantage.

SELECTION OF EQUIPMENT

Obtaining optimum performance is essentially an operating problem; however, the initial selection of equipment cannot be ignored if we are to have suitable equipment to start with. Let us consider this briefly before we discuss ways to improve the operation.

When considering the purchase of new equipment the problem is more frequently one of deciding which unit to select than just finding a machine. It is suggested that you compare; that you examine; that you test and then select your equipment.

Compare cost in terms of cost per unit produced per minute, and don't neglect to include installation costs. Compare floor space required per unit per minute, and include in the floor space assigned the area you need to work around the machine. Compare labor cost per case of finished goods. Compare accuracy and the probable annual cost of over-fill. Compare change-over time and the probable annual cost of change-overs. A simple ranking of these comparisons will frequently point up one or two outstanding possibilities.

After the comparison has been made, examine the preliminary selections at the packaging show. Examine the reputation of the manufacturer and his agent. Question them in detail regarding the performance of the equipment, methods of operation, maintenance requirements, availability of instruction manuals and parts list, etc. These men often have a wide experience which is at your disposal if you ask. Bear in mind, however, that though they are familiar with the uses to which their equipment has been put they are not operators. In general, you will find speed to be stated conservatively. Accuracy and maintenance are less well defined, and statements are likely to be more enthusiastic.

Examine the machine in the field. To paraphrase an automobile manufacturer's slogan, "Ask the man who operates one." Your prospective supplier is frequently glad to recommend a particular operation for your inspection. Competitors are often good sources of information. Don't fail to use these opportunities, for here is the place to check capacity ratings, maintenance, change-over, cleanliness, and container damage. Accuracy information is not so easily checked because of a reluctance to disclose standards and performance. Also, unless products are identical, the information will not be too reliable.

If possible, test your product at the manufacturer's shop if that product can be shipped without changing its physical properties. If possible, test your product on a small machine at your own plant.

Compare, examine, test. Selection of equipment on this basis will prevent the impulse buying that your merchandise manager is trying to promote at the retail level.

ACHIEVING OPTIMUM PERFORMANCE

Now that we have selected our filler, we can assume that, new or old, we are not talking about optimum performance in terms too far exceeding what we should expect. What we should expect, that is, in terms of accuracy, capacity, maintenance, change-overs, etc., and what can we do about improving these factors. To generalize from here on is dangerous without a specific case to discuss. However, let us consider each of these points briefly.

CONTROL OF ACCURACY

Accuracy of filling has in the past been considered secondary to capacity in the selection of equipment. I believe this is unfortunate and wrong. And I believe that the spotlight being turned on this phase of filler operation by higher costs and shrinking profit margins confirms this belief.

Degree of Accuracy to Be Expected. The degree of accuracy you should expect must be determined by you alone, as it will vary with product and equipment and, if volume fill is used, the container also will be a factor in this determination.

Manufacturers' statements can be used as a guide; however, manufacturers are frequently limited in their facilities for testing and are forced to indulge in approximations. These approximations are subject to three errors in addition to those caused by limited facilities: (1) They are too often made on a single and therefore not necessarily representative sample of your product. (2) They do not specify the percentage of individual weights that will fall within stated limits. (3) They are occasionally made on the basis of incomplete information held by the manufacturer regarding the performance being obtained on his equipment at other locations.

You can help the manufacturer when you submit your samples. In submitting samples of your product send several representative of the range of physical variation. In requesting weight accuracy statements, ask for the limits that will include two-thirds of the individual weights. You can then assume that doubling these limits will include 95 per cent and tripling will include 100 per cent of the individual packages if the filler is properly operated.

Use of Statistical Control Methods. You may determine the accuracy capability of your existing filler by using relatively simple statistical methods which are available. You can make the determination quickly and accurately and from it establish the control limits that the filler is capable of maintaining. If these control limits are narrower than the tolerances permitted by the sales department, product requirements, and legal limitations, the average can be controlled at label weight and optimum conditions will exist. If required tolerances are narrower than control limits, tolerances must be changed, product control improved, or more accurate filling obtained by improvement of the filler. Before jumping to any of these conclusions, however, consider carefully what can be done to improve filler capability. The replacement of worn parts, cleaning, and careful adjustment will improve accuracy. This should have been done before making the capability study, but you will probably not realize the rigorous attention needed for optimum results until confronted with the inability to attain the accuracy you desire or to stay within tolerance.

Conversely, careful interpretation of control records will occasionally permit you to anticipate the need for maintenance. I have in mind the case where the loss of polish from a chrome-plated volume measure is gauged by the package-to-package variation in weight. Close and accurate supervision of filler operation and of product characteristics is the key to accuracy. Control methods are good tools but, however elaborate, do not in themselves adjust the filler or indicate the reason for an out-of-control condition. There may someday be devices available to do this, but I know of none that now show any prospect of being able to handle high-speed multi-head fillers. The well-trained operator, well supervised, is our only recourse today.

Control of the *physical properties of the product* is a universal requirement for accuracy. Of these, apparent density and flow characteristics are the most important. Apparent density (specific gravity in the case of a liquid) is affected by particle size, particle shape, temperature, moisture content, and the degree of aerification. Flow characteristics of the product will affect your measurement. Here again particle shape, viscosity, and degree of aerification must be controlled. These problems are usually subject to control if management desires to develop the necessary procedures. Most people find no difficulty in understanding how these factors influence the accuracy of volume fillers. Net-weigh fillers, because of the speed of their operation, are only slightly less influenced.

Where measuring is done by the container itself, *dimensional accuracy* is essential. This is a problem for your supplier, and you will find that he can usually do better if you insist. This statement applies equally well to whatever materials your containers may be made of.

Control of filler accuracy during operation can be improved by appropriate *sampling* methods. Statistically sound methods will usually result in more accurate control, a better history, and a means of indicating to operator and supervision alike when adjustment is necessary and—just as importantly—when adjustments are unnecessary.

The value of improved accuracy can be determined from the cost of your product. Where a conflict exists between speed and accuracy, it can often be reconciled by equating the possible losses due to overweight against the possible gain due to reduced labor and overhead. Where product value is high, small gains in accuracy can be exceedingly valuable. In one case with which I am familiar, a four-year effort on the part of a company resulted in an improvement of accuracy to the extent that errors of 1 per cent of label weight were reduced to one-half of 1 per cent, the average overweight was reduced by 6/10 of 1 per cent, and the savings per year ran into six figures.

CONTROL OF CAPACITY

Just as filler capability standards and control limits are used to gauge the performance of accuracy, so a gauge is desirable in order to judge the performance of a filler with regard to capacity. The gauge in general use is the calculated efficiency of the machine. Use this gauge to find out where you stand before you attempt to judge the performance of the filler itself.

Determining Your Line's Efficiency. Calculate an efficiency for your entire line by dividing the actual production by speed per minute multiplied by 480 minutes per eight-hour shift. You may leave out luncheon and relief periods if you do not schedule these times, but do not use any synthetic or average down-time allowance. If, computed on this basis, normal output is not 90 per cent of theoretical, you have a job on your hands. If it is not 95 per cent, you have no reason to be complacent.

At an efficiency of 50 per cent it will be pretty obvious where capacity is being lost. At 80 per cent it may not be so obvious, and the best way to find out is to use a high stool and a stop watch. Study the filler and determine the cause for every stop, every missed filling cycle, and every damaged container; tabulate the amount of time for capacity loss according to cause. The higher the efficiency, the longer the study of this sort that will be required. If you can achieve 95 per cent efficiency for one hour, 95 per cent for the day or the week is within your grasp. This detail is necessary in order to isolate losses in the filler from losses due to interruptions caused by lack of product, shortage of containers, or stoppages at subsequent operations in the line. Losses of capacity in the filler will vary according to the type of machine, container, and product involved.

Types of Loss and How to Deal with Them. Typical of such losses are losses due to reduced rate of operation, maintenance time, and change-over time. *Reduced rate of operation* on weighing equipment frequently stems from a slow weighing cycle due to restricted material flow or poor timing of the cycle. Speed of weighing will affect accuracy, and conventional net weighers are restricted to 3- to 3½-second weigh periods. Slow conveyor speeds and poor timing that may delay movement of containers in and out of the filler are frequent sources of loss. The size and type of container will influence this factor. However, transfer time over one second should be viewed with suspicion.

Volume-filling rates of either liquids or powders are generally much more rapid. The cycle may be as low as one second for large, wide-mouthed containers and a free-flowing product or 3½ seconds for a 32-ounce narrow-mouthed container and a viscous liquid. Larger ports, better timing, or higher vacuum will frequently increase capacity without necessarily decreasing accuracy.

As for *losses due to maintenance time,* it is my belief that ideally there should be no unscheduled maintenance. To the extent that you can eliminate over-size pieces of material from the product and obtain uniform containers, smash-ups can be avoided and maintenance reduced. Establishment of standards for timing and wear of parts when properly administered can also produce drastic reductions in unscheduled maintenance. When breakdowns do occur, there is no substitute for competent maintenance personnel. I should like to emphasize this point, because in every operation of every size there is a need for the skilled mechanic; and, whether he be one of a general maintenance group or assigned exclusively to packaging equipment, he should be specifically selected and trained. This is a subject worthy of a session in itself, inasmuch as there is a great deal of controversy over whether mechanics of the caliber required are made or born. In any case, you are fortunate if

you have one man in 10 of this type on your staff. If you do not have such a man, you will have to reconcile yourself to a long training period or a long search outside your organization. There is much to be said for the idea of a school sponsored by manufacturers and equipment users.

Scheduling maintenance, as its necessity is revealed, is usually preferable to the seasonal shutdown and overhaul frequently practiced. The seasonal shutdown may be very practical in industries with extreme seasonal demands, such as food canning. However, in non-seasonal operations equipment should be ready to go at any time. If maintenance need at any time becomes so great as to require a week or two of shutdown for repair, you can be sure that efficiency will have slipped pretty badly before that time has been reached and the total cost will be greater in the long run.

Repetitious types of maintenance, scheduled or unscheduled, indicate the need for engineering changes. The equipment manufacturer is probably in the best position to do this and should be consulted in any case.

Change-overs are frequently troublesome as to time consumed both in the change itself and in final adjustments made after production has supposedly been resumed. Different fillers employ adjustments or change parts to varying degrees—most involve both types of conversions. Proper storage of change parts is essential to orderly and rapid changes. A rack or open shelf next to the line, or a portable rack that can be brought to the line, is desirable. Color coding of change parts is frequently advantageous when three or more sizes are to be handled. A definite step-by-step plan of the sequence of operation on all but the most simple machines will be worth while for guidance and training of mechanics. Dummy containers, pin gauges, and templets will frequently expedite adjustments. This is especially true when the gauges are combined with the use of a timing dial.

The *destruction of containers in the filling cycle* represents a direct loss of efficiency as well as of product. Faulty adjustment of the equipment and faulty containers will affect this factor. The determination of which fault predominates is frequently difficult to make. At machine speeds of 60 per minute or less, visual observation is frequently sufficient. At speeds of more than 350 a minute visual observation, using a stroblite, is effective. Unfortunately, the greater part of our equipment is progressing rather rapidly into the middle area of 100 to 300 cycles per minute, where effective observation is most difficult. One possible solution has been the taking of moving pictures at 68 to 128 frames per second. This is effective but slow because of the developing time. The alternate choice of test runs of carefully selected containers is more rapid and more costly and provides less identification of the cause. Do not be too quick to condemn the container as faulty. It can be stated categorically that a properly adjusted machine—filler or otherwise—will accept and adequately handle a wider variation in containers than a machine not so adjusted.

Careful specifications of containers and prompt reporting of every deviation to the supplier will assist him in meeting your needs on the line. Loss of paper and board containers should be less than 2 per cent,

one-quarter per cent chargeable to the filler. Loss of glass and cans should be one-half of 1 per cent for the line and one-tenth of 1 per cent for the filler. Machines combining several functions of the line will exhibit a smaller damage rate than a series of separate units.

After capacity indexes and accuracy standards have been established, and after efficiency is above 90 per cent and the desired accuracy has been achieved, speed may be increased. Increase speed in small increments of 5 to 10 per cent, and watch the accuracy and capacity indexes. As deficiencies of containers or machines show up during this phase of your program, engineering changes may be necessary. Use your indexes of efficiency and accuracy to determine the degree of their success. I have left this suggestion for increasing capacity by increasing speed to the last because I believe it is not to be resorted to until accurate efficient operation has been established. I do not, however, intend it as any defense for operating at less than the speed for which you purchased your equipment.

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In summary, obtaining optimum performance from filling equipment is an operating problem that requires the cooperation of Management, Engineering, and Purchasing. There are no short cuts. Select the most suitable equipment available for your needs; establish indexes for performance with regard to accuracy and capacity; control your product; and exert every effort to eliminate unscheduled maintenance. Troubles that heretofore have been given scant attention must be traced to their source and controlled. The dollar savings in labor cost, product yield, packaging material yield, reduced maintenance, and overhead costs will amply repay your efforts.

DISCUSSION

MANUFACTURER'S RESPONSIBILITY

Question: Mr. Moyat, should a machine manufacturer's representative remain with a new installation at no expense to the buyer until the equipment is operating at the rate and capacity expected when it was purchased?

Mr. Moyat: I do not think that ordinarily it is necessary. It is a matter of keeping the good will of the supplier and the manufacturer too. If you have a skilled mechanical staff, you really do not need the manufacturer's representative.

Question: Why is it that equipment manufacturers do not adopt some of the ingenious methods worked out by users to improve their own equipment?

Mr. Wiley: Most of the "ingenious methods" are worked out for specialized jobs. But, when a machinery manufacturer designs equipment, he generally wants it to suit as many people as possible. The companies that use it may have to add certain gadgets, yet we certainly would never

pay the manufacturer to cover his machines with these specialized attachments. That is more or less up to the user.

Question: Mr. Parsons, do you think that filling equipment manufacturers are sufficiently aware of the cleaning and change-over problems relative to such equipment?

Mr. Parsons: I think that there are some good machines on the market that are not too difficult to clean. Apparently, therefore, manufacturers *are* aware of this problem, as well as that of change-over. Naturally, both must be considered by the purchaser, too, in making his selection.

OPERATION AND MAINTENANCE

Question: Chairman Lee, do I understand that you believe all packaging operations should maintain better than 90 per cent efficiency? Maintenance, then, is largely a case of understanding machine history?

Chairman Lee: The answer to the first part of the question is "yes." The answer to the second part we hope is "yes." In machine operation, the history of machine maintenance is most helpful and, if properly interpreted, will aid in reducing the amount of maintenance necessary. I certainly feel that we should strive to keep efficiency above 90 per cent.

Question: What in your opinion constitutes normal speed and accuracy for an auger filler?

Mr. Wiley: That depends on whether you are using a rigid container, a folding box, or a flexible package. Generally, you should get fair accuracy with an auger filler up to 35 or possibly even a few more cycles per minute on the individual auger. We have run, on very small weights, as high as 60 cycles per minute and had very good results. That will not be true, however, on heavier weights; in fact, you may drop down to 15 cycles or even less.

Question: When equipment is operated at a lower speed than that which is ultimately desired, in order to establish efficiency and accuracy, can management not be accused of a "speed-up" when speeds are raised to increase capacity?

Chairman Lee: There is always that possibility, yes. In general, I do not believe that the practice of operating a machine at less than the normal rate of speed, in order to get the ball rolling and establish certain norms, is the proper way to start. The problems that show up at the normal speed will not show up at the slower speed and you will have the whole job to do over again. As to complaints which may arise from the labor organizations, I think you should lay the cards on the table before you begin and indicate the ultimate speed at which you intend to operate the machine. You may never reach it, but it is a good idea to have a high sight well established.

Question: You stated that only one maintenance man out of 10 can adequately service packaging equipment. How can this type of man be selected?

Chairman Lee: That is a problem that plagues all of us. There is a great deal of argument as to whether you take a first-class machinist and teach him to do maintenance work on packaging equipment or

whether you try to find somebody who is not as highly qualified as the machinist but who shows a natural inclination and train him from the ground up. However, it is very difficult to spot such people. There are some techniques being used experimentally, but it is a subject that is not too well understood.

Question: Chairman Lee, can you elaborate a little on the statistical methods used to determine when a filler needs adjustment?

Mr. Lee: Briefly, the thing to do is to establish the limits within which the filler weights will normally vary and to plot these on a chart. If the average of any sample then falls outside the limits on the chart, it is a signal that something has changed. The average is beginning to move. And, if your machine is adjustable, you can make the necessary alteration.

The control limits are usually set not for individual weights but for the average of a small group of 4 to 10 packages. The problem is to determine the normal variation of that average and then compare the average of a test sample with those limits. If the test sample falls outside those limits, the chances are, if the control limits are reasonably set, that you will not be wrong in assuming that the filler needs adjustment more than one or two times in a thousand. If you set the limits too tightly, you will run a greater risk of making an adjustment when it is not necessary.

Mr. Schommer: One thing we should remember in talking about the statistics of quality control is that it is certainly not a foolproof method for controlling weights. It is strictly a tool, and the way in which we use it will dictate to a great extent the results we get.

In installing the control system in our plants, where we are using the operators to control the scales, we discovered that it took quite an educational program to get them to see the benefits of the system. Many of the operators thought that we were going to use it like a hammer held over their heads.

Question: Mr. Parsons, are automatic filling machines practical for biological materials? Can they be used when you have rubber in aluminum closures?

Mr. Parsons: The procedures used in packaging biologicals have not changed very much in the past 20 years, the reason being that we are, for the most part, worrying about small runs and many different sizes. However, we are gradually mechanizing. The machine manufacturers have not been too interested in biologicals because, for one thing, there are not many people in the field and the problems are rather specialized.

There are, at the present time, machines being developed which are satisfactory for fully mechanical filling of vials and ampules. And there are automatic machines available now for putting rubber stoppers in containers and, of course, applying aluminum seals.

Question: With liquids, what is considered a desirable time allotment for changing over from a round to a rectangular bottle?

Mr. Gouveia: That depends entirely on the type of equipment you have—whether you have to change the entire line over or whether you have to change just one machine. Whether the bottle is square or round

I do not think makes much difference if the size remains the same. When you change sizes, however, it means changing the conveyors and all the parts on the machine.

OVER- AND UNDER-FILLS

Question: Mr. Parsons, what can be considered an allowable number of under-fills per run?

Mr. Parsons: In the drug field, we do not feel that we should have any under-fills. Statistically, we operate with 99.5 per cent over label strength.

Question: What weight tolerance should a filler maintain on one- to three-pound packages of flour or cereal at about 60 per minute?

Mr. Schommer: I am not too familiar with our flour-weighing equipment. As to cereals, our largest unit is a 12-ounce package.

Again, the weight tolerance will depend on the material. On a flake product, if you can hold a 12-ounce package an eighth under or a quarter over, running at 70 packages a minute, you are doing a good job.

Question: What per cent net weight deviation constitutes good commercial practice in powder filling in small packages that range from one gram to three or four ounces?

Mr. Parsons: I am not very familiar with our history in that range. In a somewhat lower range, accuracy is kept within 1 per cent.

Chairman Lee: You normally allow a deviation of 1 per cent on small packages?

Mr. Parsons: Yes.

Mr. Wiley: I think that such a deviation would be allowable in rigid containers in the drug field, but in the contract field you would have to allow as much as 3 to 5 per cent for most small powder fills.

Chairman Lee: Here, again, the physical characteristics of the product will enter in. I know of a uniform product which is being volume-filled in a rigid one- or two-ounce container—with the standard deviation running about 0.03 of an ounce.

Question: Is the tolerance norm re-expressed in extremes, plus or minus, or does it represent a statistical range with occasional wild throws?

Mr. Parsons: I think it pays in almost all filling to use a quality control chart and sound statistical procedures, taking into consideration both the ranges and the averages. In many cases, we have found differences in individual machines which will amount to tremendous losses of product per day. And those differences show up very quickly on control charts.

QUANTITY CONTROL

Question: Mr. Parsons, what method of checking is used to determine whether a container is under-filled or filled correctly as to quantity?

Mr. Parsons: We use weight as the method of measuring the fill, although it is true that for a few of our liquid fillers we do use volume. I am thinking particularly of small doses of 1- to 10-cc. fills of liquid.

In the case of some of the liquids, we check only four times a day, because of the extreme accuracy of the piston-type fillers we are using. Then we have the opposite extreme, checking as much as once every two

minutes on a high-speed filler where we have more difficulty with variation.

Question: Chairman Lee, you have stated that close and accurate information on filler operation is essential. Will you comment on the value of continuous, automatic, 100 per cent check weighing, with weight indication, to provide this information and thus facilitate keeping the filler in control?

Chairman Lee: How, in other words, does automatic check weighing fit into production practices?

In our experience, we have not found it to fit in at all, largely because equipment that is available is itself too sensitive to undergo normal factory abuse or too slow to handle the output of the equipment. It is also tremendously expensive. And, if you weigh or measure your product accurately in the first place, you do not need check weighing. Sampling will give you just as good a record at less cost, though not necessarily for all types of products.

Mr. Schommer: We use automatic check-weighing equipment where we have a definite recipe tied in with the product. If, for instance, the directions accompanying a cake mix specify three-quarters of a cup of water, and a package goes out with, say, an extra ounce of the mix, the consumer probably will have a failure and we probably will have a complaint. On such products, therefore, we have been using automatic check weighers, and they have done a good job for us.

Question: How has the General Electric X-ray machine for high and low levels worked out?

Chairman Lee: The General Electric device consists of an X-ray sensitive crystal; by passing a narrow beam of X-rays through a container to the crystal, you can measure the density of the atmosphere or the package or the material between the source of the X-rays and the crystals. As far as I am aware, it has been successful on liquid filling only. On powders, it has a rather low sensitivity when the density of the material is less than 0.5. Uniform level of the product in the package is also a necessary condition for effective operation.

Question: This GE equipment is offered for sale without a rejection device, since the X-ray machine itself is supposed to be able to handle cans even when they are jammed together on the conveyor without any space between them. What kind of rejection device is available which will push a single can off a line when it is squeezed between two other cans?

Chairman Lee: I am told that food machinery manufacturers and others are producing equipment suitable for use with the X-ray level detector. I think that an air blast is frequently used. One other possibility is the use of a star wheel to engage the cans immediately as they leave the detection equipment and then eject them from the pocket of the star wheel with some sort of suitable delay action.

GOVERNMENT REGULATIONS

Question: What are the government regulations on underweight?

Mr. Parsons: The government asks us to use "good pharmaceutical practices." By that term, which is commonly used, it is inferred that we should take all normal precautions to prevent under-fill.

Mr. Gouveia: The government states that your standard of fill, if it is a half-gallon, has to be a half-gallon. On the other hand, you also are allowed certain tolerances and you must conform to good commercial practice. In general, you are expected to try to fill exactly.

Question: How about a package containing two ounces plus one one-hundredth of an ounce which stays in the package after use?

Chairman Lee: I assume the questioner refers to a powder which you cannot get entirely out of the package. Let's take up this question of over-fill as a matter of policy. Mr. Gouveia?

Mr. Gouveia: You can hardly afford to over-fill in our business, where you have a tax of in excess of $10.50 per proof gallon. That amounts to about $0.074 per ounce. Last year, if we had over-filled one-tenth of an ounce, we would have lost over $10 million in taxes alone.

Mr. Schommer: The only time that we have deliberately over-filled, I should say, is when we have had a change in the volume of a product. In the case of our cereals, if, owing to processing difficulties, the volume has dropped considerably, we have deliberately over-weighed to give good package fill. But, as Mr. Gouveia says, if you deliberately over-fill constantly you are going to lose money. There is no question about that.

Mr. Wiley: We handle a tremendous variety of items for a great many different clients. When you handle such a variety, you always have one fear—that you will under-weigh. Consequently, we would rather err on the side of being over than under. The length of the run or the size of the job determines the amount of trouble we will go to in order to cut overweight to the absolute minimum.

Mr. Parsons: In the drug field we are required, in the case of injectables, to put enough excess in our containers that we can conform to the label contents. In our oral preparations, we are required only to put in what we say is in the container and not to consider the container holdback. But, as a matter of practice, we put in enough excess to take care of container holdback.

Mr. Moyat: In our field, in which we deal with three-quarter-pound packages of candy, nutmeats, and so forth, we naturally are used to over-fill, because we know by experience we are liable to under-fill.

We formerly took the attitude that, on a carton with 24 or 36 units, we would be allowed an average. We were considering gross tolerances in our controls and allowing the departments to run a small fraction under in some packages and to over-fill in others. Then, after being cited on an individual package, we deliberately started to over-fill.

In our business, the loss is not so serious as in the drug line. We have gone to some trouble to reduce the allowances on the packages, but we have to over-fill because we cannot take a chance on under-filling.

Chairman Lee: A note from the audience informs me that there is a slack-fill provision in the Pure Foods Law that sets the formula at 85 per cent full. I suggest that anyone who is worried about this point check it with his legal department, for I think it is difficult to pin the Pure Food and Drug people down to an exact statement on what they will accept as reasonable tolerance. And I think they are quite justified in not making such a statement. If they were to settle, for example, on 2

per cent, plus or minus, there would be little incentive on the part of many to do better. However, as long as they leave the matter open, there is always room for improvement and possible benefit for the public as a whole.

Question: Mr. Schommer, are there any government regulations limiting volumetric outage, when the weight may be correct in any given package?

Mr. Schommer: I do not believe there is any law which states that you have to have a certain percentage of fill. But, in our opinion, a good full package has its merits, especially as far as the consumer is concerned.

Chairman Lee: I think we would all agree to that. We don't want to put out a half-empty package.

PRODUCT PECULIARITIES

Question: What losses, other than those caused by over-filling, are likely to occur in the filling machine?

Mr. Gouveia: You are bound to have losses in the case of volatile material such as we deal with.

Question: Then, when evaporation takes place in a whisky-filling operation, there is definitely a resultant loss in proof?

Mr. Gouveia: It is pretty hard to pin down. We know that we lose out in the filling machine, and we know that the type of the filler has a lot to do with the loss, but loss in proof cannot be measured any closer than a tenth of a proof for commercial purposes.

Question: Does any one-pound and/or five-pound pre-weighing, high-speed equipment exist for very fine powders which easily become highly aerated and flow like water?

Mr. Wiley: If I were going to net-weigh such material in five-pound lots, and wanted extreme accuracy, I would try to make two fills (2½ pounds each). There are several machines on the market that will do the job.

Mr. Schommer: I think that is correct. I might suggest investigation of the Carter-Vac, or a two-scale gross-weight weigher, where you have a load fill and then a dribble fill, to get your accuracy.

Chairman Lee: Anybody who tries to use conventional equipment for a product so fine that it dusts badly will have difficulty in keeping dust out of pivots and off the beams and the rest of the mechanism of any weighing device. Something special in the way of equipment is going to be needed.

Question: What is the best way to eliminate sticking and the building up of oily powder substances in the weighing equipment of packaging machines?

Mr. Schommer: We use the pneumatic-scale cone-type feeder, which keeps a constant head on the scale without putting too much weight on it.

We have found that if, in the case of products with a high fat content, you try to keep too heavy a head, you are going to have your product and your packaging equipment gummed up. One of our products

in particular is very high in fat content; with it, we use so-called tubular-type weighers where the product is fed into a tube that rotates and then is deposited in the package. In that way, we keep a very light head or no head at all on the machine.

Chairman Lee: It is exceedingly difficult to keep such products from crumbling up. The principle to follow is to keep them in motion and not let them remain stationary if you can possibly prevent it.

Mr. Schommer: Another thing that helps is to keep your product as cool as possible when you are feeding it to the weighers, especially if you have a product with fat in it.

Question: Mr. Gouveia, how can we compensate for the effect of differences in the viscosity of liquids?

Mr. Gouveia: Viscosity makes a great deal of difference in filling. As it increases, if you are using a certain type of machine, you may find that you have to increase the size of the filling tubes. Or, if it is a vacuum-type filler, you may be able to increase the vacuum to obtain proper filling rates.

Question: Foaming presents a serious problem in filler speeds of 100 to 120 bottles per minute. How may this be overcome?

Mr. Gouveia: Sometimes, if you are using a vacuum filler, you may have your vacuum too high. Increasing the diameter of the filler tube so that you do not get such a high velocity in the tube will sometimes help; actually, reducing the speed will probably solve the problem.

Mr. Parsons: I find that both reducing the vacuum and slowing the speed are important in this connection. Also, the selection of the bottle for a particular product may help to eliminate foaming.

Question: What are the most effective techniques of achieving uniform density in flaked or granulated products for use with multiple-head fillers?

Mr. Wiley: I would use a special mechanism, probably a vibrating feeder or some such device, and feed each hopper or each pocket directly from the feeder. That is the only way in which you can be sure of a uniform fill each time.

Mr. Schommer: I might add that a uniform constant head of material over your volumetric fillers is very important. We have little volumetric filling except on our one-ounce cereals, but I am convinced that a constant head, on volumetric filling and weighing, is highly essential.

Mr. Wiley: The design of the hopper also is important. Most manufacturers recommending a machine for a specific purpose will also recommend a type of hopper to go with it. The best thing to do is to supply them with a liberal sample of the material and let them offer suggestions.

Chairman Lee: You may have a product which, as it comes from processing, is not of uniform density. For example, moisture may vary, owing to lack of control in the process itself. Under these circumstances, one possibility is to reduce any variations to slow changes which you can follow with adjustments of your machine. Where the changes occur so rapidly that they cannot be properly followed through a machine adjustment, blending the product produced over an hour or two hours—or even as long as eight hours—will be of help.

Also, you may have a mixture of materials which are not of the same practical size. If so, you should remember that any time you transfer your product from one location to another you are inviting segregation. Hence, the importance of correct bin design.

EFFECT OF CONTAINER

Question: Mr. Parsons, what can be considered a normal deviation in volume and dimensions of containers for filling equipment?

Mr. Parsons: It depends entirely on your equipment and your particular program. In setting up specifications for containers, I think you should not ask for a tolerance which is going to create a hardship if it is not necessary for the operation in question.

Question: How do you avoid under-fill and over-fill when the accuracy of a volume filler depends on the volume accuracy of the bottle?

Mr. Gouveia: The only thing you can do is to strike an average. If you check your bottles at least every hour or every two hours, you can then see where you are. If you are high or low, there has to be an adjustment of the machine.

Again, because of the value of our product, we try to come just as close as possible to the proper fill. If we do not, by the time night comes and we check the tanks in the bottling room, we find our losses are so great that, next day, somebody will be complaining.

Question: Mr. Gouveia, which would be more conducive to accuracy in filling—a glass or a tin container?

Mr. Gouveia: I should imagine that the glass container would be a little more accurate than the tin, because of the method of manfacturing. Under normal conditions, with the glass company's 100 per cent inspection, you stand a good chance of staying within the standards set by GCMI for standard-size bottles.

DAMAGED CONTAINERS

Question: When glass containers are used, what damage is to be expected in the packing line?

Chairman Lee: In my opinion, if your loss in glass containers is averaging over a half of 1 per cent on the filling line, it is considerable.

Question: Do over-all losses of 2 per cent or less on folding cartons operating at 165 packages per minute represent a reasonable average?

Chairman Lee: It depends on your equipment. If you are running 165 cartons per minute through several machines, it is probable that a 2 per cent loss is not unreasonable. However, if the cartons are running through a single machine—that is, performing all parts of the operation—2 per cent might be slightly high.

Question: What is considered a reasonable percentage of faulty folding cartons received from the supplier?

Mr. Schommer: The number of faulty cartons can be very considerable over the years. I do not know whether I can quote a percentage, but at times it has run fairly high—say, upwards of 5 to 10 per cent. Again, it depends on what you mean by "faulty"—whether warped, torn, or other-

wise unacceptable. We have had to return entire shipments to the manufacturer because of warpage.

Question: How do you distinguish trouble due to faulty cartons from machine-caused trouble?

Mr. Schommer: We attempt to run a test on empty package material as a shipment arrives from the supplier. In other words, from a carload of cartons we will take, say, seven containers with cartons in them and actually give them a runability test. If any trouble occurs, we try to determine at that time whether it is due to the carton or to the machine.

Chairman Lee: That confirms my suggestion that finding out what goes wrong at lower speeds constitutes good detective work. Close examination of damaged packages will sometimes reveal the cause of the trouble, and the point in the operation at which the damage occurs will sometimes indicate what has gone wrong.

Mr. Schommer: One thing we have occasionally done is to put an observer recorder on the line full-time in an attempt to analyze the cause of our difficulties. In one particular case, the period of observation extended over days on two lines, and the results we obtained from a review of the charts were rather startling. We found that, in many cases, down time was due to running out of product or waiting for people to return from lunch or rest periods. In addition, much of our loss was due to poor adjustment and to waiting for mechanics, waiting for paper-changing, etc. Yet, when we started out, we thought we would find that most of our difficulties were with machine operation.

Question: Mr. Moyat, what percentage of spoiled cellophane can be considered normal for a bag-forming and filling machine?

Mr. Moyat: On a semi-automatic machine, it should be not higher than 2 per cent.

Chairman Lee: Mr. Wiley, do you have any information on losses of cellophane or transparent wrapping materials in package-forming and filling equipment?

Mr. Wiley: On pre-made packages, the loss should average not more than 2 to 3 per cent. However, if you form and fill in one operation, you are normally going to have a tear loss of 5 per cent as an average—though sometimes it may be lower with exceptional web or higher with poor web.

Question: What happens when electric-eye registration is added? Does it increase materially the amount of damaged material? Does down time increase?

Mr. Moyat: On the contrary. We have found that electric-eye registration definitely decreases spoilage.

Chairman Lee: Have you had any experience on acetate laminated foils?

Mr. Moyat: No, we are using pliofilms extensively.

Chairman Lee: Would they behave much like cellophane?

Mr. Moyat: Once you know how to handle them, they behave better.

Chairman Lee: Mr. Wiley, do you find that electric-eye registration increases trouble on the packing line?

Mr. Wiley: Not if you have personnel who know how to handle the equipment. It is just one more gadget that has to be adjusted and kept working.

BIOGRAPHICAL DATA

THE CHAIRMAN

As Technical Assistant to the Director of Manufacturing and Engineering at General Foods Corporation, *Edward P. Lee* is concerned with production economics, special studies, and quality control. Since 1939, when he joined General Foods, he has worked in the Diamond Crystal-Colonial Salt Division and the Maxwell House Coffee Division in the Machinery Development Department, covering the fields of industrial engineering, production, general plant engineering, and special equipment development. Mr. Lee holds an M.E. degree from Antioch College.

THE PANEL MEMBERS

With the Fleischmann Distilling Corporation since 1941, *Wilbur R. Gouveia* has been in the distilling field for over 25 years. He began his career with the Century Distilling Company as Chief Chemist and worked in the research laboratory at Hiram Walker before joining Fleischmann as Plant Superintendent. He became General Superintendent of Production in 1945 and was named Technical Director in 1950. Mr. Gouveia was recently elected President of the Distillers' Feed Research Council.

Immediately after leaving the University of Minnesota in 1939, *William P. Schommer* joined General Mills, Inc., as a foreman in the processing department of the Chicago cereal plant, and he became Assistant Plant Superintendent before moving to the Buffalo cereal plant as Plant Superintendent. He has held his present position as Cereal Manufacturing and Packaged Food Superintendent since 1945.

In his present position as Vice President of The Stevens-Wiley Manufacturing Company, *William G. Wiley* specializes in contract packaging and has been closely concerned with filling equipment. He has been associated with the company since 1928, becoming Vice President in 1937.

Ernest J. Moyat has worked with the Curtiss Candy Company for 20 years, is now Plant Superintendent at Chicago, and serves on the company's manufacturing committee. He received his master's degree from the University of Karlsruhe, Germany, in 1924. Immediately after his arrival in this country, he joined the AETNA Insurance Company as a safety engineer. In 1928, he moved to the KW Storage Battery Company, where he acted as a sales engineer and Assistant to the Vice President.

Carr H. Parsons has been with the Lederle Laboratories Division of the American Cyanamid Company since 1934, when he received his B.A. in bacteriology at Antioch College. He began as head of the anaerobic department, concerned with tetanus and gas gangrene. He has also supervised penicillin production. At the present time, he is Manager of the Filling and Packing Section at Lederle.

Automatic Processing Of Orders for Packaged Products

¶ **Grant S. Johnson**

Supervisor, Planning and Production
Package Division, Richmond Refinery
Standard Oil Company of California, Richmond, California

THE MECHANICAL order-processing system in use at the Standard Oil Company of California's Richmond refinery was not developed in terms of the refinery's requirements alone but rather in consideration of company-wide order-handling procedure. For this reason, I believe that it will be of interest to review briefly the company's objectives and plan of operations, following this with a discussion of the procedures used to achieve an integrated package-ordering system. Within this framework the use of tabulating equipment was indicated as a necessary tool for accomplishing the results desired.

In 1948 we were near completion at Richmond on a new seven-acre building which was designed to consolidate all grease manufacturing and filling, small package filling, warehousing, and rail and truck shipping. A similar centralized warehouse and shipping unit of comparable design was also under construction at our El Segundo refinery. These modern facilities incorporated the latest thinking on mechanized, streamlined package handling consistent with our sales pattern. But it was our belief that the true potential of these new plants, in terms of over-all company benefit, could not be realized without improving the entire package order handling procedure. This would mean a review starting at the order source in the Marketing Department field station and extending through the refinery system of order-processing and packaging operations.

A joint Manufacturing-Marketing Department study of broad scope indicated the desirability of several fundamental procedural changes. These became specific objectives for each refinery package division and were as follows:

¶ THE AUTHOR

Except for the war years, which he spent as a Colonel in the Air Force, *Grant S. Johnson* has been with the Standard Oil Company of California since his graduation from Stanford University. He has worked in various phases of inventory control and packaging at the Richmond refinery, and was named Supervisor of Planning and Production in 1949.

1. Reduce the scheduled processing time for handling package orders through the refinery package division.
2. Consolidate all package division planning and scheduling activities. The increasing complexities of manufacturing and marketing emphasized the need for centralizing this function to strengthen management's control over operations and further the aims of service and economy.
3. Improve inventory controls to permit maintenance of lowest possible finished goods, containers, and purchased stock inventories.
4. Reduce operating costs by providing a completely integrated procedure for handling orders.

THE OVER-ALL PLAN

With these objectives established, a basic plan of operations was mutually accepted by all affected major company departments, including Manufacturing, Marketing, Traffic, and Distribution.

The problem of reducing order-processing time involved improvement of field ordering practices. We had for many years tried various combinations of manually prepared order forms, but were never able to overcome successfully such inherent difficulties as proper nomenclature of product and package, legibility, and authorization and had no provision for regulation of order quantity flow to the refinery.

A pre-printed order form, indicated as the solution to the first difficulty, listed all the principal items normally ordered in the product line with the respective authorized package combinations clearly shown.

The regulation of the quantity of orders received was considered important, because a uniform daily workload would permit economies throughout order-processing and package-handling operations. This was accomplished in part by establishing "cycle ordering," which is similar to cycle billing, wherein specified stations order on designated days and frequencies and, with mailing time considered, a reasonably uniform number of orders is received daily at the supply point. This cannot be an absolute control because of marketing situations, but it has proved to be a worth-while directional benefit.

A centralized planning and scheduling activity was established within each refinery package division whose function it is to assure that all packaging elements are available when needed, using methods which stimulate low-cost operation. We call this *Central Planning*. An essential requirement for the success of this operation is the provision of accurate, current, and complete information upon which decisions can be made combining facts with judgment.

With this plan of operation, the need for mechanical order-processing equipment was clearly indicated. To meet the demands which have been outlined, tabulating card equipment was obtained. This choice was a natural expansion of facilities and trained personnel which had been used for many years to provide historical sales data.

Finally, to complete the operating plan, each refinery warehouse stock layout was designed to exploit service, with easy accessibility and high

turnover rate. The operating procedure was developed to promote minimum order filling from stock and emphasize direct filling for shipment.

ORDER PROCESSING

Bearing in mind this over-all plan of operation, which was installed at Richmond and El Segundo refineries, let us now focus our attention on the actual use of mechanical order processing at Richmond.

ORDER FORM RECEIVED

We serve customers and stations located in the states west of the Rockies, Alaska, and Hawaii, as well as export customers, resulting in shipments of approximately 400,000 packages per month or, on a daily basis, about 50 truckloads and 25 carloads, totaling 1,300 tons. The procedure for processing these orders, for purposes of demonstration, will be limited to the domestic station order pattern, although the same general plan is used for the other types of shipments, such as export, wax, asphalt, and chemicals.

A typical domestic station order, in full truckload or carload quantities, consists of about 75 per cent, by weight, of filled drums of various products; the balance consists of miscellaneous small packages ranging from 15-gallon drums to cartons of 4-ounce cans.

The actual order processing starts with the receipt of such an order at the refinery on a form of the pre-printed type mentioned earlier. In a typical order there are eight pages covering the 600 principal movers of the product line. Exhibit 1 shows a portion of the first page. The heading is typical, containing the usual information. The subheading contains the cross reference to the type of authorized container, such as "Returnable Iron Barrel," "Service Barrel," etc. Also shown are the order-packing units. These are based upon tier and pallet quantities of warehouse stocks at the refinery. A "¼" under "Returnable Iron Barrel" means—to the ordering field station—"order 1, 2, or 3 drums up to 4, and then in units of 4," four being a full pallet load if furnished from inventory. A "1/16/48" under "5-Gal. Pail" is interpreted similarly—"any quantity up to 16, then units of 16 up to a full pallet load of 48, then units of 48." Small *x's* are used to show unauthorized product-package combinations, the open squares representing permissible packings.

WORK OF CENTRAL PLANNING

Upon receipt of the order at the refinery, the first step is "dressing," which is essentially a verification for completeness and accuracy and the addition of an abbreviated destination symbol at the top of the order—for example, "PA," which means "Ponca." It is then passed along for "scheduling" by Central Planning.

Scheduling includes order review and the establishment of a shipping date and loading spot, consistent with planned packaging operations. Briefly, this involves: analysis of each item for quantity to assure proper source, such as "stock" (that is, from warehouse inventory), "fill for direct shipment," or combinations thereof; balancing shipping requirements with

SHIP TO STANDARD OIL COMPANY OF CALIFORNIA — PACKAGE ORDER S-860-1 — CHECK HERE IF DISTRIBUTOR [X] — PA — 4/17 — 1953

P.O. BOX 248 Porterville

DEST'N PONCA — STATE CALIF.

TOTAL WEIGHT OF ORDER 32600 — SALES DISTRICT BKFLD — ORDER NUMBER 2

FOR REF'Y USE — ROUTE SP — COMBINE WITH — RULE 14 — MIN. WEIGHT 30000

( ) LONG HTR – REFER NOTE — PAGE

AUTOMOTIVE & AVIATION MOTOR OILS

5501 INDEX A/23 PAGE NO.

PRODUCT	QUANTITIES ORDERED				PRODUCT	QUANTITIES ORDERED							
TYPE OF CONTAINER	RET. IRON BBL.	SERV BBL	5 GAL PAIL	24/1 QT CTN	TYPE OF CONTAINER	RET. IRON BBL.	SERV BBL.	5 GAL PAIL	1/5 GAL CTN	4/1 GAL CTN	24/1 QT CTN	12/1 QT CTN	12/4 OZ CTN
ORDER PACKING UNITS	1/4	1/4	1/15/48	1/12/48	ORDER PACKING UNITS	1/4	1/4	1/15/48	1/15/48	1/15/64	1/12/48	1/15/40	1/48/192
RPM SUB ZERO MTR. OIL SAE 5W		xxx	xxx										
RPM MOTOR OIL SAE 10W	2												
RPM MOTOR OIL SAE 20/20W	8	3	12	48									
RPM MOTOR OIL SAE 30													
RPM MOTOR OIL SAE 40	3	1											
RPM MOTOR OIL SAE 50													
RPM DELO HVY. DUTY LUB OIL SAE 10W			xxx	xxx	RPM OUTBOARD MTR. OIL SAE 30		xxx	xxx	xxx	xxx	xxx	5	xxx
RPM DELO HVY. DUTY LUB OIL SAE 20				xxx	RPM OUTBOARD MTR. OIL SAE 40		xxx	xxx	xxx	xxx	xxx	5	xxx
TOTAL CONTAINERS	13	4	12	48	TOTAL CONTAINERS							10	
CONTAINER WEIGHT GROSS	442	442	42	53	CONTAINER WEIGHT GROSS	442	442	42	44	36	53	28	5
TOTAL CONTAINER WEIGHT	5746	1768	504	2544	TOTAL CONTAINER WEIGHT							280	

ASPHALT	5
AUTOMOTIVE GREASES	3
AUTOMOTIVE OILS	1
AVIATION GREASES	3
AVIATION OILS	1
BASE & REFINER OILS	6

RECEIVED APR 20 1953 PLANNING SECTION

WEIGHT RECAP OF PAGE — 10842

OPTIONAL STOCK IF EXTRA WEIGHT NEEDED — APPROVED

S-860-1 (34M-7-52) PRINTED IN USA

EXHIBIT 1

PRE-PRINTED ORDER FORM, STANDARD OIL COMPANY OF CALIFORNIA

filling plant workload to obtain uniform use of labor, equipment, and stock; and arrangement of loading to effect a planned use of space and personnel.

The shipping date and loading spot are shown in the upper left-hand margin of the order—for example, "4/23" (April 23, 1953) and "5501" (Spot 1, Track 55). Shipment is scheduled for the fourth day, including day of order receipt. An invoice number is then assigned, and the order is passed along to the Tabulating Section. This is a continuous process for the orders received up to 1:30 P.M. each day; it is a manual operation and does not differ from the previous system except for the advantages of the pre-printed form and the inclusion of realistic scheduling.

TYPED SCHEDULES DISTRIBUTED

Tabulating translates the order as it now stands into a deck of punched cards from which filling schedules, inventory reports, and filling documents can be mechanically prepared. These carry all the order information, including the pre-established source, but only the data necessary for visual checking are interpreted. The cards, representing all orders, are sorted mechanically by drum, source, type of container, and type of product and listed on a typed schedule in eight copies for the drum-filling sections.

Exhibit 2 is an example of one of these schedules for Department 11, the source for these particular items which appeared on the original order. The column headings have been added for explanation: name of product, package type, destination abbreviation, quantity, loading spot, invoice number, date of shipment, and prime container code. The last-named specifies the particular package in terms of gauge, color, fittings, etc., to be used. Note, too, that like oils have been grouped for filling purposes.

A copy of this same schedule is used for oil manufacture and drum preparation. For orders received on Monday, the schedule is in the hands of the drum-filling sections by Tuesday at 10:00 A.M., including final review by Central Planning before distribution is made. The oil will be made available and filling completed Wednesday for shipment Thursday. As with other schedules, the production is recorded directly on the sheet, thus serving the dual purpose of a directive and a record of performance.

The instruction for obtaining drums for these fillings is accomplished by preparing a drum-reconditioning schedule. This is a re-sort of the same item cards used for preparation of the filling schedule just outlined, but arranged in terms of container rather than product. It is deliberately tailored to give total drum requirements by particular type as shown by the prime container code.

INFORMATION FOR WAREHOUSE USE

Thus far we have mentioned only the drum items for direct filling which appeared on the original order. But there remain the small packages, from 15-gallon drums to cartons of 4-ounce cans, and drums which were coded for "stock" to be taken from inventory. We match the stock item cards for the original order against a special deck which carries location based upon quantity. This information, together with the data on the item card, is combined and a new card produced, which is called a warehouse

DRUM FILLING SCHEDULE

11 LUB OIL FILLING SCHEDULE

PRODUCT NAME	PACKAGE TYPE		DEST.	QUANT.	LOAD SPOT	INVOICE NUMBER	SHIP DATE	CONTAINER CODE
RPM MO 2020W	RIB		KH /	4	3052	154575	4 23	09 01 003
RPM MO 2020W	RIB		MO /	2	3033	154577	4 23	09 01 003
RPM MO 2020W	RIB	➡	PA	8	5501	190001	4 23	09 01 003
RPM MO 2020W	RIB		CBA	4	5302	154571	4 23	09 01 003
				18*				
RPM MO 2020W	SB		PTB /	8	3053	154559	4 23	08 01 002
RPM MO 2020W	SB	➡	PA	3	5501	190001	4 23	08 01 002
				11*				

EXHIBIT 2

DRUM-FILLING SCHEDULE

STANDARD OIL COMPANY OF CALIFORNIA

stock-picking card. On it the interpreted information for warehouse use is shown: type of container, product description, transfer invoice number, stock location, number of packages, destination abbreviation, loading spot, date of shipment. The cards contain all information necessary to obtain and deliver stock. The locations are divided into full-pallet quantities and less-than-full-pallet quantities, which is the basic layout plan for the warehouse.

We shall now demonstrate the use of these cards under actual warehousing conditions.

1. A packet of these cards for each destination, divided as to pallet quantities and less-than-pallet quantities, is received by the warehouse foreman.
2. The pallet-quantity cards are given to a fork-truck operator who picks full pallet loads and delivers direct to the rail or truck loading area.
3. The less-than-pallet-quantity cards are sorted by aisle-location sequence and hand-picked in the rack area. The tractor and trailer train traverses the rack area without backtracking and proceeds to either the rail or the truck assembly area. As the item is picked, the quantity is circled and the packet returned to the foreman.
4. These accumulated trainloads are then moved to the respective rail or truck loading area. A typical rail shipment, before loading, consists of trailer train from the rack assembly area, pallet loads from the warehouse reserve area, and drums arriving by conveyor which had been filled for direct shipment. The car loader checks each item against his shipping manifest for final load verification.

SHIPPING MANIFEST AND TRANSFER INVOICE

The final step in the order-processing procedure is the development of shipping manifests and transfer invoice documents. These are prepared from the original item cards and the heading cards.

The manifest set is prepared and used by the Shipping Section to effect actual loading of boxcars and loads accumulated for truck delivery. It serves as a basic document with the loader, indicating dunnaging material used and actual quantity shipped. The manifest is then reviewed; and, consistent with such corrections as may be required, the retain cards from which the manifest was made are mechanically processed to prepare the transfer invoice, an identical document used to bill the consignee for quantity only. Copies go to the Marketing Department for pricing and issuance of commercial invoice as required.

Exhibit 3, a schematic flow chart which shows the interrelation of the several steps we have discussed, will serve to better visualize and summarize this package-ordering procedure.

STOCK REPLENISHMENT

We have reviewed briefly the use of tabulating equipment in order processing. Another important application which we use as an integral part of our Central Planning is the procedure for replenishment of ware-

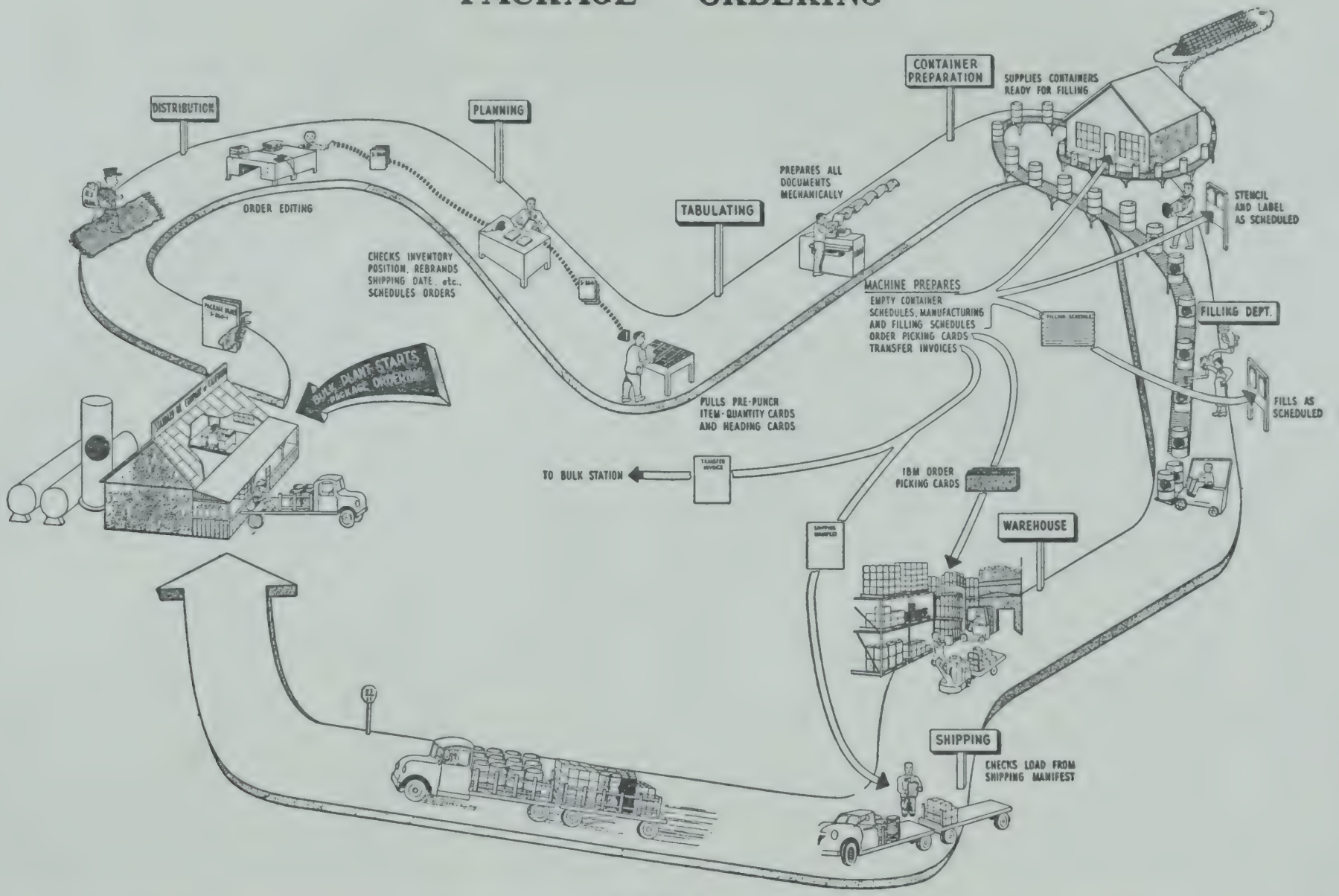


EXHIBIT 3

SCHEMATIC ORDER-HANDLING CHART, STANDARD OIL COMPANY OF CALIFORNIA

house stocks. This is handled separately, although it is closely coordinated with order-processing methods.

DAILY INVENTORY REPORT

An inventory situation on filled stocks is processed each day to provide Central Planning with a complete daily status of every product-package combination carried in inventory. This is known as the daily inventory report, an extract portion of which is shown as Exhibit 4.

The total tape includes approximately 1,000 items, and the column headings, which are generally self-explanatory, include: product code, product description, package code, package description, date of last activity, quantity on hand, quantity on allocation, unallocated balance on hand, quantity on order, order point, maximum inventory. "Quantity on allocation" means orders in process, scheduled but not shipped.

USE IN PLANNING

This report is the basis for replenishment planning. The items are arranged by product and, for each product, by the appropriate package sizes. This alignment permits ready analysis of any product in all its package sizes for combinations to effect economical batch production and/or filling runs.

The item to be ordered is underlined, and the quantity (in pallet units), source department code, and date required are indicated on the sheet—for example, "5-gal. pails of RPM Motor Oil 20-20W" (480 ordered from Department 23 for April 24). The report with these notations is then processed by the Tabulating Section to prepare the small package filling schedule, grease manufacturing and filling report, warehouse tally cards, and empty container tally cards.

Small Package Filling Schedule. A small package filling schedule is available the folowing morning and is forwarded to the filling section. It shows product, package, destination (in this case, stock), quantity, date required, and container code.

Batch Record and Filling Report. A batch record and filling report has been designed for the manufacture and filling of greases. It is interesting to note that this form replaced six previous hand-prepared documents. It is made in four copies and is used, in addition to manufacturing and filling instructions, for purchased stock usage performance and as a permanent record of batch manufacturing and test results.

Warehouse Tally Card. A warehouse tally card is prepared for each item to be filled for stock. After placement of stock the warehouseman circles the quantity and the card is returned to the Tabulating Section, where it is processed as an addition to stock on hand in the daily inventory report.

Empty Container Tally Card. The filled stock replenishment pattern in our plant requires a means of obtaining empty packages from storage, accounting for their use and spoilage, and if possible serving as a job ticket for the filling line operator. This is accomplished with cards prepared in conjunction with the small package and grease filling schedules

DAILY INVENTORY REPORT

4/20/53

BRAND CODE	PRODUCT DESCRIPTION	REG. CODE	PACKAGE DESCRIPTION	LAST ACTIVITY	INVENTORY ON HAND	ALLOCATED	OPEN BALANCE	ON ORDER	ORDER POINT	MAX
2031 01	RPM MO 2020W	1	RIB	4 20	7	5	2	8	8	16
2031 01	RPM MO 2020W	295	24/Qt CCN	4 20	1611	552	1059	1008	960	2400
2031 01	RPM MO 2020W	452	5/G PL	4 20	181	29	152	480 23 4/24	144	624
4604 04	RPM OUTB MO 30	1	RIB	4 16	12		12		4	16
4604 04	RPM OUTB MO 30	293	12/QT CCN	4 20	966	150	816		240	1020
4605 04	RPM OUTB MO 40	1	RIB	4 16	32		32		8	32
4605 04	RPM OUTB MO 40	293	12/QT CCN	4 20	566	78	488		240	1020

EXHIBIT 4

DAILY INVENTORY REPORT (FILLED STOCKS)
STANDARD OIL COMPANY OF CALIFORNIA

just mentioned. Exhibit 5 shows examples of empty container tally cards which cover these conditions.

The cards are interpreted to show the location of each container required on the filling schedule and are thus used as requisitions to obtain the packages from storage. They are returned with the packages and are used by the preparation section for marking, labeling, stenciling, etc. Passed along to the filling line, they serve as job tickets, with the operator logging his production and spoilage at the end of the filling run. We use the same card by sending it back to Tabulating to make the reduction from the empty package inventory record.

INVENTORY CONTROL

We have reviewed the principal features of order processing and stock replenishment. Now let us look very briefly at examples of data mechanically prepared and used by Central Planning for inventory control of empty packages, purchased compounding stocks, and general supply items.

Our basis for control of approximately 350 different kinds of empty packages is based upon a code system that identifies the package for purposes of ordering, storage, and use. To this end we define packages as prime containers, which are those that hold the product (such as a drum), and secondary containers, a packing for the prime container (such as cartons for quart cans). In the weekly empty package inventory report, two columns—"Date of Last Activity" and "Accumulated Usage to Date"—are useful supplements for control and analysis purposes.

The inventory control of 150 purchased compounding stocks is effected from a weekly type of report which is similar in style to the empty package inventory report except that usage is furnished on a supplementary listing. In addition, a report is prepared monthly, from a physical count, for the 200 miscellaneous package accessories covered under general supply items.

These forms demonstrate our principal uses of tabulating equipment for handling station orders. The data included, together with the schedules and controls required for the balance of our total packaging operation, are provided by a Tabulating Section of six people.

RESULTS TO DATE

We have reviewed the principal features in the application of mechanical devices for order processing and direct plant control within an integrated procedure at Richmond refinery. These are the general results in summary:

From a company-wide viewpoint, service to marketing has been improved and stations can adjust their inventories with reliance on a guaranteed shipping cycle. This, together with improved operational controls at the refinery, has permitted a material reduction in order "cuts," rush, and L. C. L. shipments.

The refinery package division has benefited through the availability of current, complete information upon which to base realistic scheduling and planning. This has resulted in improved labor utilization. The multiple use of schedules and cards has allowed line-supervision emphasis on

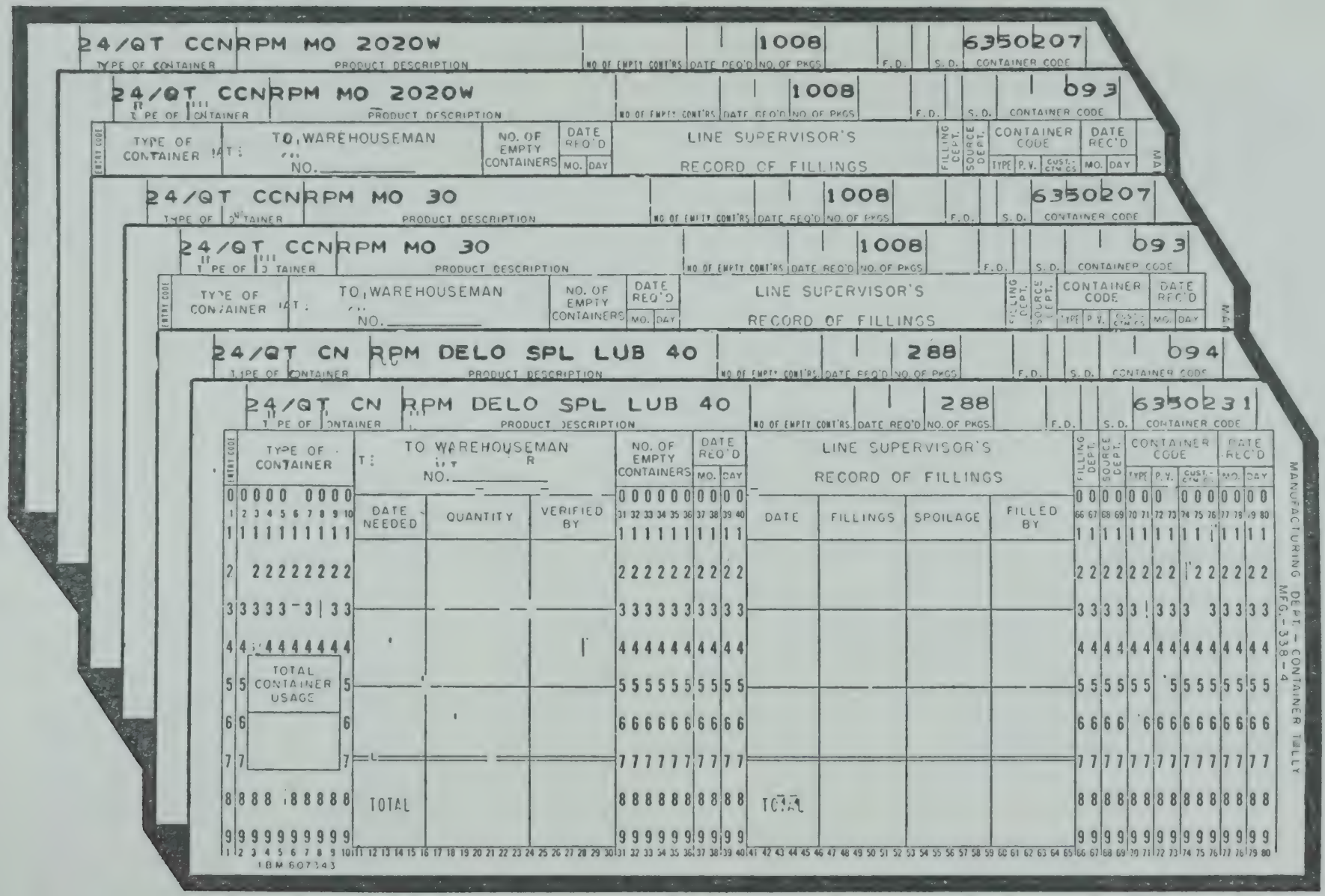


EXHIBIT 5

EMPTY CONTAINER TALLY CARDS

STANDARD OIL COMPANY OF CALIFORNIA

production instead of time-consuming manual record keeping. Accounting records have been materially improved, and the total inventory investment has been reduced about 25 per cent. Two indirect benefits which we did not entirely anticipate involved, first, the necessity for an absolutely complete review of every item for coding purposes. This focused attention on many items heretofore buried in manual records. Secondly, the necessity for training and explaining mechanized procedures to personnel resulted in their improved proficiency and appreciation of their part in the system. This has manifested itself in many improvements aimed toward more efficient plant operations.

Lastly, a major contribution to the over-all effectiveness of this tabulating system has been its adaptability and flexibility for analytical as well as operating purposes. This applies particularly to the correlation of sales patterns to economical plant operations and inventories, and in this field we believe only a part of the potential has been realized to date.

Packaging Considerations in Converting to Self-Service

¶ Datus W. Berlin

Assistant General Manager, Gimbel Brothers, New York City

PACKAGING IS to mass distribution as automatic machines are to mass production. Mass distribution requires exactly the same kind of efficient coordination of all elements as does mass production. The elements of scheduling, material control, production control, line production, and production standards are all present in mass distribution. We are just beginning to develop these techniques in distribution. The chief reason that we are so late is that distribution has been associated with merchandising and selling, which have traditionally been related to genius and inspiration. To continue the analogy one step further, consider the development of the trades and crafts. When I was starting in business, the craftsmen used to say, "Our business is different. You can't standardize our work because it requires years of experience and skill and you can't substitute for that." We have all seen most of the crafts taken apart and put back together, and the results have always been less expensive, higher-quality products after the mystery has been knocked out of them. We are in the process of knocking the mystery out of distribution—all the way from ad-

¶ THE AUTHOR

Following his graduation from The Carnegie Institute of Technology, *Datus W. Berlin* was a printer for a number of years, until, in 1942, he joined McKinsey and Company as a consultant. Later he spent three years with Cluett Peabody & Company, where he coordinated sales, manufacturing, and warehouse operations. Mr. Berlin has been Assistant General Manager at the New York store of Gimbel Brothers since 1950.

vertising through item selection and stock control. It is more evolution than revolution. We still see standard brands which should be strictly mass-distributed being advertised by the "entertainment" or "brilliance" technique. Every buyer whom I approach on standardizing stock control assures me that it can't be done. But it *is* being done.

Just as in the instance of streamlining the crafts, there are basic and imperative needs for making changes in our traditional techniques for distribution. All the conditions for distribution have radically changed, but our techniques have not caught up with these changes.

CHANGES IN BUYING PRACTICES

A large percentage of our customers have been conditioned to self-service in the supermarkets. They prefer this high-speed purchasing. They prefer to make their own selection, which is made easier than ever before because they are pre-sold by advertising and because supermarkets have perfected display, packaging, and point-of-sale promotion to the point where selection is fun.

In department stores, it becomes more and more difficult for the customer to buy. Service is frequently insufficient and inadequate. The time required for shopping and buying is entirely disproportionate to the value either of shopping or of the services procured. The only people who can afford to do an intelligent buying job are those who have few other demands on their time. The majority are forced to buy on a hit-and-run basis and are apt to accept the disappointments in quality, service, or other aspects of the products which they buy as part of the risk of buying hurriedly. The customer is becoming impatient and frustrated. Time is too valuable, and self-service education is too strong. The contrast between self-service and standing in line to be waited on is too great. If salespeople sold, there might be compensations, but salespeople haven't time to sell and many do not have the training or inclination.

CHANGES IN RETAILING PRACTICES

Department stores have traditionally been service organizations. However, operating costs have forced stores to skimp on services. They employ fewer salespeople, promote cash-and-carry, skimp on wrapping costs, and employ every labor-saving gimmick which their ingenuity can devise. Unlike a manufacturer, a retailer can cut costs quickly and drastically and still stay in business. Of course, service may suffer and the customer may take the brunt.

There are many real and tough operating problems which retailers are attempting to solve. For instance, a large percentage of the store's business is done on two days of the week, the days varying by location. A large percentage of business is done during three hours of the day, also varying by location. At Gimbel Brothers in New York, our peak hours are from 11:30 to 1:30 and 4:30 to 5:30. For one of our competitors they are 12:30 to 2:00, with less of a bulge later in the day. The period 11:30 to 1:30 happens to be when our salespeople are at lunch. No matter how you figure it, that *is* lunch time. The problem is obvious. When most people want to buy, we are at lunch.

Another real problem is maintaining efficient merchandise turnover while presenting a broad selection of items. This is a problem which

bears directly on package design and upon the customer's problem of getting what she wants. Turnover can be increased only by maintaining sales volume with less inventory or by increasing sales volume with the same inventory. The former is achieved by control. Simply reduce the open-to-buy. But the effect of this is frequently out-of-stock, out-of-business, on important, profitable items. This can be corrected only by rigid and intelligent stock control. Most buyers are not bookkeepers.

The second method of increasing turnover lies in having what the customer wants. This is achieved through broad selections of the right depth; again, rigid stock control is required, plus astute buying and selection. The obvious solution to increasing turnover is to reduce the number of items. Therefore, you will find that most stores today are sorting out the low-volume, marginal producers and tightening their merchandise lines. They are improving stock-control methods, reducing purchase quantities, increasing frequency of purchase. An outstanding example of this can be seen in the much-publicized housewares department of one of our competitors. When they re-organized this department, they reduced the number of items by 30 per cent, reduced total inventory, set up minimum stocks based on 60-day turnover of each item, eliminated advertising, reduced deliveries by 50 per cent, completely re-staffed and re-designed this department, and set up self-selection. Now they are showing a substantial increase in both volume and profit. This is the pattern.

CONVERSION TO SELF-SERVICE

Shopping is no longer the exciting adventure of yesterday. Our problem is to satisfy the high-speed, pre-sold buying habits of today's customers. Therefore we have converted from shops to markets. In so doing, we have come to realize that the merchandise presentation and the package are among the most important and least exploited factors in the merchandising picture. We hear a lot of talk about visual selling, self-service, self-selection, and supermarket selling. Let's lump them all together. They are all techniques for arranging merchandise so that the customer can make her own selection. Whether or not she actually carries it away from the display to a cashier is a detail for closing the sale —or, if you prefer, getting the money. When we look at it this way, we realize that most of our stores are "supermarkets"—with two outstanding differences:

1. Merchandise is not adequately identified with signs and display arrangements for pure self-selection.
2. Packaging is usually inadequate for proper identification and selection of items.

PACKAGING REQUIREMENTS FOR SELF-SERVICE

In starting to think about packaging for self-service, we must first clearly define our objectives and policies. If we look at packaging results in the so-called non-self-service commodities, it appears that the objectives of the average package designer are these:

1. Be competitive. This includes attractive art work and competitive material and construction cost.

2. Make the package distinctive. It must attract the customer's attention when lined up with competition.
3. Emphasize the brand name.
4. Relate the size and shape closely to competition.
5. Use materials that are serviceable while maintaining minimum cost.

These are all reasonable and businesslike objectives. The only criticism which might be made of them is that they are in terms of the results of making packages and being on competitive terms with other package makers. They are typical of the objectives of most of us in that we become so engrossed in our personal problems and in the technicalities of our own operations that we lose sight of, or are uninformed on, the problems and objectives of our customers. If we are to do an effective packaging job for self-service, it is imperative that objectives be defined in terms which are more closely related to the objectives of the customer. They must also take into consideration the problems of all three groups of customers: the packaging industry's customer, the manufacturer; his customer, the retailer or distributor; and finally the retailer's customer, the ultimate consumer.

PROBLEMS OF THE MANUFACTURER IN SELF-SERVICE SELLING

I have indicated that retailers must have greater turnover and that this is accomplished by eliminating low-producing, low-turnover items. Thus manufacturers will tend to go out of business on these items unless they take action and design, price, and advertise them to take them out of this category. This, then, should be one of the first considerations of packaging.

Experience indicates that, although self-service tends to increase volume of sales, it tends to reduce the amount of the average transaction. This indicates that the lower-priced item is being selected. The next consideration in packaging, therefore, should be the nature of competitive items being displayed beside your product. What can be done to make customers reach for your product, to keep it from becoming a low producer?

Next, self-service is likely to produce tighter stock control, more frequent re-ordering, smaller quantity orders. What action will the manufacturer take to provide this service? Many are filling in stock themselves. What are the implications here in packaging?

In terms of self-service packaging requirements, the objectives of the designer should be approximately these:

1. The package design must provide for easy and quick identification of the product.
2. It must provide maximum opportunity for inspection of contents.
3. It must provide for concise and emphatic explanation of benefits of product.
4. It must provide for maximum efficiency in maintaining selling stock —in stacking and in conserving space.
5. It must be durable, protect the product, and compactly contain it for carrying by the customer or for riding a belt and a delivery truck.

6. It must provide for every possible service which can be added as plusses—such as identification of sizes, increasing unit sale, utilitarian design for related use when emptied, reserve and forward stock control, and related selling.

When these are the objectives in designing packages, it becomes clear that considerable research, analysis, and ingenuity will be required for adequately solving the problem of your three customers while still maintaining a coordinated balance for optimum over-all results. Many of the solutions will be found in the store where there is ample information for those who take the trouble to get it. One thing that need not concern the package designer is the danger of waste or loss if his package completely meets the requirements for self-service even though the product is not now sold by self-service. Any factors which will facilitate self-service will be equally effective for other kinds of selling. There is a great advantage in preparing in advance for self-service. Those products which have anticipated the need will certainly have a great competitive advantage over those which have not when self-service is adopted—as well as before it is adopted.

A SIMPLE EXPERIMENT

Consider hard-hitting merchandise promotion. If you want a quick and easy demonstration of its importance, conduct a little experiment. Think of any item that you might buy, then go to a store and see if you can find it without any help from store employees. First, see how easily you are able to identify the general classification of merchandise. Next, see what is required for finding a particular item. When you have found your item, try to make a selection from the various brands that are carried. You might spend a little extra time and see if you are able to locate all the brands of the item which are carried by the store. They will probably be in several locations. Now, why do you select one brand over another? Are the reasons spelled out for you? How is it constructed? What is the best way to use it, or to care for it to insure maximum use and service? I believe if you try this simple experiment you will agree that the results are appalling. It is the simplest way I know of learning what should be done to prepare for self-service—especially in package design. Of course, considerable research must be done to develop the answers.

While you are conducting this little experiment, consider if you will the effect that strong advertising and promotion will have on the choice of brand by the customer who is conducting such a search. It has been said that the final decision is usually made in the store, but this cannot discount the effect that pre-selling and advertising will have on making the decision. It does recognize the self-service practice of displaying all brands and styles of an item, such as a flatiron, in one place and the tendency to stack quantities of each item or brand side by side on the fixture. This gives the customer the greatest possible freedom of selection. It must be remembered that the retailer's chief interest is in selling the greatest volume, at the highest mark-up, of the goods which the customer wants to buy. The only preference that can be given an item

is minor advantage in display. From there on, the customer makes the final decision. This demands strong, honest, hard-hitting point-of-sale promotion.

WHAT THE RETAILER WANTS

Package requirements, expressed purely in terms of the problems of the retailer, might be summed up in the following rules:

1. Give the greatest possible display potential while providing for assortment display. Standardized fixtures provide for lining up brands and for less featuring of individual brands.
2. Provide adequate information—directions and statement of benefits—for encouraging self-selection and reducing requirements for clerk assistance.
3. Provide for display of samples as well as proper and easy identification of stock stacked on the fixture. In other words, identify the sample display with the stock. The inclination of the customer seems to be to carry away the sample rather than take a package from the stock beneath the sample.
4. Eliminate the necessity for wrapping, which is expensive both in materials and labor. This is one of the expenses that stores would like to eliminate.
5. Provide for maximum quantity of forward stock and minimum replacement while consuming minimum selling space. This is particularly important when there is a large range of styles or sizes—for example, in men's shirts.
6. Provide for maximum opportunity for examining and comparing. Customers insist upon touching and feeling unless they have been completely pre-sold. This factor will undoubtedly become less important as customers become educated in self-selection and *as brands become narrowed down to the familiar ones by pre-selling and point-of-sale promotion.*
7. Provide for forward stock control and for reserve stock control and re-order. Some manufacturers have provided IBM cards which can be collected by stock people and forwarded to their warehouse for replacement ordering.
8. Put the price on the package. This eliminates store price-marking and greatly facilitates movement of stock to the selling floor.
9. Package in standard units and quantities with clear identification on cartons of bulk quantities and styles to eliminate the necessity for handling and counting in the receiving room. This, too, will speed the movement of merchandise to the selling floor.
10. Provide for maximum combination possibilities to increase the unit sale—for example, cartons of Coca-Cola. There are still too many cracker barrels.
11. Provide for related selling by references in copy, by family design, or by other forms of suggestion both to the customer and to the retailer.

CONCLUSIONS

Let's agree that academically, ideally, and practically a good job is not being done in packaging for self-service. Mass distribution of non-food lines has a long way to go. There are tremendous opportunities for the store, the manufacturer, and the package designer for improving selling efficiency. Let's agree that manufacturers who have not prepared their products for self-service are losing business and that they are facing the prospect of losing far more business as more stores adopt self-service.

Let's agree that the necessity for reducing selling and operating costs, and for improving ease of shopping, have made self-service selling a necessity—that it is only a question of coordinating the requirements and improving the techniques before it will be generally adopted. And, just to eliminate some of the stigma that is being attached to the term "self-service," let's agree that we really mean arranging merchandise for easy, quick, and pleasant shopping and buying, at the same time arranging to do maximum sales volume at minimum expense.

Packaging's Role in Reducing Distribution Costs

¶ Walter S. Driskill

Director and General Sales Manager, McCormick and Company, Baltimore, Maryland

IMPROVED packages and package designs can contribute a great deal toward decreasing the comparatively high cost of distribution today. The reduction of distribution costs is a vital concern of all of us, and particularly so when we realize that the normal manufacturer receives on the average approximately 50 cents of every consumer's dollar, the remaining 50 cents being absorbed by the various costs of distribution.

I use the term "distribution" as a catch-all, perhaps, but I should like to define it to include all those costs involved once the product leaves the manufacturer—transportation, warehousing, advertising, sales, and all other influences which actually cause the consumer to buy the merchandise from the retailer. Money invested in the proper package design can

¶ THE AUTHOR

After serving with the U. S. Navy during the war as a Lieutenant Commander, *Walter S. Driskill* was Director of Athletics at the University of Maryland and President and General Manager of The Baltimore Colts Football Club, Inc. In 1951, he was elected to the Board of Directors and appointed General Sales Manager of McCormick and Company, where he had previously been Assistant Director of General Sales. He holds B.A. and M.A. degrees from the University of Colorado.

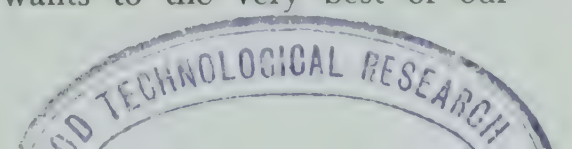
certainly be the most profitable investment any manufacturer could make; thus the package could easily become the lowest-priced but, at the same time, the most productive salesman any organization could employ. Packages come in contact with customers hourly, daily, constantly, and must sell themselves most of the time in direct competition with other products and, therefore, other packages. As a result, I am convinced beyond any doubt that alert, aggressive packaging can do more to reduce the exorbitant costs of distribution in today's self-selection marketing than perhaps any other one factor which influences these costs.

AN INCREASINGLY COMPETITIVE MARKET

We are just beginning to operate in a free economy with the abolition of the final government controls. There have been, up until this point, only two significant price rises—in two such different products as sulphur and coffee. We are once more depending upon the age-old laws of supply and demand for the sale of all products; thus a greater premium will be placed on salesmanship as a profession. We regard package design as an aggressive, alert, *talking* salesman, and in a free competitive economy it will be increasingly more important to give attention to this salesman which is readily available to all of us, manufacturer and retailer alike.

We are certainly in a highly competitive marketing era—one which will become rapidly more competitive in all lines of business endeavor in the months and years ahead. With the tremendous increase in production of all types of goods and services, greater ability to sell and distribute these products to the people of America is essential. The many rapid changes in the distribution pattern demand the constant attention of all sales and marketing executives. This ever-changing concept of moving merchandise to the consumer gives the packaging industry an enviable opportunity for rapid progress in its chosen part of the over-all distribution picture. Naturally, with an opportunity for progress and advancement an obligation and a tremendous challenge go hand in hand. If I may, I should like to discuss these opportunities, challenges, and obligations in the light of the distribution pattern as a whole and make every effort to illustrate how important packages and containers are to the most recent changes in marketing conditions.

Those engaged in the design and production of packages for the manufacturer have an opportunity to make a genuine contribution to American industry by tailoring their activities to the needs of the various customers they serve. Those who are charged with the direct responsibility for sales and marketing are keenly aware of the opportunities they have to be of material assistance to all of us through alert, tailored design of their product to fit our needs as manufacturers. We in turn must combine the manufacturing element and the packaging element in order to be of service to our customers, the retail people, and they in turn to the ever-changing whims of the consumer. We must not forget that the consumer is king in the market place, and we must do everything we can to anticipate his needs and supply his wants to the very best of our ability.



The packaging industry is in a position to determine the sale of our products once they reach the point of sales in any retail outlet—the very location where all business is done. All other steps in the distribution picture are necessary but are simply a means to an end, that end being to get the product—or package, if you will—and the prospective purchaser together in some retail outlet. There the selling job must be done, and in many instances the package rises or falls on its own merit. Therefore, it is easy to see why it is absolutely essential to have a talking package for any given product, because this package—without benefit of human assistance—must sell itself to the consumer in competition with other packages containing similar products merchandised one next to the other.

THE SALES MANAGER'S PROBLEM

We feel that it is a relatively simple matter to sell "goods," as we say in the grocery business, but it is a vastly different and most complicated matter to sell these "goods" at a profit. It is obvious to everyone that profitable selling or marketing of merchandise is the only kind which can long survive in our system of private enterprise. I say that intelligent, aggressive packaging can well be the answer to a great many of our merchandising problems as well as the present relatively high cost of distribution.

What are we constantly trying to do in sales management? We are striving to increase the actual amount of time our people spend face to face with their customers. That is the only way in which we can successfully market our products. Our time studies, job descriptions, reports, and call pattern, as well as compensation, selling cost, and the other details with which sales management is necessarily concerned, all are actually building steps essential to the fact that we must get our people to spend more time selling in face-to-face contact with a customer. All this, mind you, is necessary, while at the same time properly designed live packages are automatically selling consumers constantly at all retail levels, largely without the benefit of any help from a salesperson. For emphasis, then, may I repeat that we are convinced that aggressive, intelligent, tailored packaging can be a terrific instrument for good—and, very naturally, the converse is equally true.

I don't want to rush over the word "tailored," for with the rising cost of doing business in this competitive economy it is a concept of the utmost importance and one which I should like to develop here. It is imperative that we know what we are trying to accomplish and what markets and groups of people we are trying to reach. The days of scatter-shot selling, hit-and-miss techniques, traveling the side roads, hoping for the best, are doomed or shortly will be, so that we must know where the potential exists for whatever products we are selling and the most profitable way of reaching this potential. It seems logical, then, to review the changing population of America, not only in terms of growth in numbers but in terms of family groupings and age brackets as well as the shifts from one part of the country to another. We must know what these people need, something of their purchasing power, and just what they are likely to buy.

CHARACTER OF PRESENT POPULATION

The population of the United States of America in 1953 is estimated to be something in excess of 161 million people, which is an increase of some 22 per cent, or 28,600,000 people, in the 13-year period since 1940. Significant, however, is the fact that while the total population was increasing by 22 per cent, the number of children under 10 was increasing by 57 per cent and, as is easily understood, the number of family households was increasing by 33 per cent. This indicates, of course, a most favorable outlook for those manufacturers whose products are necessary for a happy childhood, as well as those people who cater to the needs of children. Thus, with the projected increase in the sale of these products, certainly those portions of the packaging industry directed to the marketing of these particular commodities should also grow rapidly.

The years immediately after World War II witnessed an extraordinarily high rate of family formation. The peak year 1948 saw an increase of 1,257,000 families. However, since that time the rate of increase in family formation has declined rapidly, and the prospects for the next several years suggest even further declines. The basic reason for this is simply the fact that the number of young people reaching marriage age is quite low, owing to the low birth rate during the depression years of the thirties, which is causing a marked reduction in the number of young adults in the population.

The expected continuance of a high birth rate has brought about a fundamental change in the size of families. The two-child family was the accepted pattern in the thirties, but it appears that the three- or four-child family is at present socially acceptable. Nearly four million babies were born in the United States in 1952, which was slightly more than the 3,833,000 born in 1951. Therefore, for two years in a row the nation broke the all-time annual record for births, which up to this time was the 1947 figure of 3,817,000 babies. It is quite interesting to note that eight new babies are born in America every 60 seconds, which means to us as manufacturers that we have a potential new customer brought into the world about every seven seconds. Even if the birth rate should not continue at these extraordinarily high levels, the huge crop of children during the last seven years—25 million of them—will exert a marked influence on many lines of business activity.

Going over these figures brings to mind the fact that approximately one-seventh of the population is made up of children under six years of age. As they grow into the older age group, there will certainly be an increase in the demand for individual-type items such as food, clothing, bicycles, schoolbooks, and other staples rather than family-type items and appliances.

MOVEMENT TO THE SUBURBS

Although it is important to realize the changes in the character of the population, it is more important to know where these people live. The trend toward a decreased number of workers in farm communities is continually brought about by mechanization of farm equipment and the desire for a city life on the part of many rural people. In the metropolitan areas of the country—of which there are some 168—the population has

grown by about 22 per cent in contrast to the over-all growth of 15 per cent. However, while the cities have grown to this extent, we must remember that in the 10 largest city areas there was a growth two and a half times as great in their suburban areas as was evidenced in the cities themselves.

This move of the great mass of population to the suburbs has been largely responsible for the development of one-stop shopping centers by all types of retail merchants. It has contributed, also, to the change in marketing concepts, since it is apparent that the needs of suburban dwellers are necessarily different from those of the urban population. We find a much higher incidence of husband-and-wife shopping in the suburbs; therefore, it is apparent that there has been a need to change the traditional nine-to-five shopping hours of the city stores. Evening shopping hours are most common, and there has been an understandable decrease in shopping done during the customary morning hours. It would seem absurd to close retail operations in the suburbs at five o'clock when just at that time the busses and trains are jammed with commuters on their way home to the suburbs and looking forward to an evening of shopping with their wives and families.

This, of course, has posed a problem for the downtown retailer who considers opening a suburban store. The great danger is simply that the regular customers will be transferred from the city location to the suburban area and that distribution costs will be increased greatly without appealing to a different group of customers or attracting new clients.

Again, we can stress the tailored market idea, since at present there are some 20 million women working today. This represents one-eighth of the total female population. Over half the 20 million working women are married and, therefore, must necessarily do their shopping in the suburbs in the evening. But, at the same time, while working women represent one-third of the adult female population, they still buy over 50 per cent of all ready-to-wear garments. By and large, for their personal shopping, this part of the population is largely forced, because of working conditions, to patronize downtown stores and thus should represent the tailored part of the population—that is, tailor-made for downtown retailers.

THE SUPERMARKET INFLUENCE

We must keep in front of us, too, the fact that all retail business is being more and more concentrated in fewer hands. With this concentration in larger stores, the smaller operators are going out of business very rapidly. During 1952, for example, 17,000 small grocery stores closed their doors. With this concentration in fewer outlets, the factors of self-service and self-selection are becoming economically more desirable in all fields. Therefore, the desirability of designing a selling package with shelf velocity is becoming more and more vital to the success of manufacturers and retailers alike.

The supermarket industry of the grocery business must be given credit for the promotion of self-selection, self-service, and one-stop marketing—which we feel is the coming thing in retailing, not only because of economics and problems of distribution but because of the change in our pattern of living. This type of service is being demanded by the consumers and thus is here to stay, since we must cater to the needs and desires of

Mrs. Consumer. We are rapidly getting more and more into a period of impersonal selling—or perhaps it could better be termed the era of a selling package. The volume of business per store is rising in retail outlets, but the number of salespeople involved has been decreasing steadily. This means that self-selection and self-service influence a greater number of products and, therefore, an obvious demand for an effective selling package. With this growing tendency toward more and more self-selection and self-service in all commodities offered for sale at the retail level, there is a definite indication that before long there will be comparatively few sales tables in any retail operation—be it food or non-food—where prospective customer and salespeople will have an opportunity to meet face to face. This fact presents a real challenge to the ingenuity of the packaging business.

IMPLICATIONS OF TODAY'S TRENDS

A few years ago there was a tremendous amount of brand substitution on the part of the clerk, with such statements as "This brand is just as good as that" and the like, but those days are gone forever. Where brand substitution was once the function of the retail salesperson, it is today the function of the package itself. This brand substitution, by virtue of package, is accomplished by visual displays, point-of-sale advertising, and package merit. Self-selection and self-service have increased impulse buying on the part of the consumer. We must realize that the proper selling package is essential to the success of retailer and manufacturer alike, since surveys recently conducted in various grocery outlets clearly indicate that food store patrons spend only an average of eight seconds in making a choice between 37 different brands on display in a self-service store. As is readily seen from this fact, it is vital that the package be capably designed, tailored to the product, and literally able to sell itself.

A sizable portion of every consumer's dollar goes to the supermarket. It is estimated that in 1953 supermarkets will do a billion and a half dollars worth of business in non-food items alone. Supermarket retailers are expected to sell at least 100 million dollars worth of housewares alone and, again, the self-sell package must be the order of the day. In 1952, to illustrate the point, 93 per cent of supermarkets handled drugs, 75 per cent housewares, 60 per cent stationery, 59 per cent sundries, 58 per cent magazines, 41 per cent soft goods, 40 per cent hardware, and 36 per cent toys. This list does not include the normal items associated with grocery stores, such as baked goods, delicatessen products, dietetic foods, liquors, and other commodities. I quote these statistics simply to indicate the powerful effect which the supermarket idea of retailing, with its one-stop service, has on items other than food.

During 1952, 75 cents out of each food dollar was spent in only 23 per cent of the food stores. In other words, three-fourths of the consumer's dollar is spent in only a quarter of the outlets. Through these marketing methods the progressive food retailers have reduced their cost in distribution from the 45 to 50 per cent of a few years ago to a remarkable 16 to18 per cent today. We feel that the supermarket retailers have pioneered this distribution pattern, which practically all retailers are coming to today, and thus have made a tremendous contribution to the improved standard

of living in America. If other retail operations would accomplish this same improvement in the immediate future, just think what a marvelous benefit it would be to all people in America.

This progress made by the supermarket industry was brought about by its close attention to population shifts and changes in shopping hours but, above all, by one-stop shopping with self-selection and self-service.

The unprecedented boom that the United States is enjoying today, with new production records being established in virtually every phase of business and the rise in personal income and actual purchasing power, is expected to continue well into 1954. This presents a challenge and opportunity as well as an obligation to those in the packaging industry. The outlook for the industry as a whole is most favorable, but to keep ahead of what I am sure will be greater demands and intense competition, the packaging industry will need to rely heavily on new designs and tailored markets. All shoppers today, whether they be men or women, are highly intelligent and want to pick up a package which will literally tell a direct and honest story and encourage them to sample the various products.

How does *your* package rate for impluse buying, self-service, and self-selection?